

FIG. 1

HEADER INFORMATION (SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
:	
NODE NUMBER N	
NODE ATTRIBUTE INFORMATION OF NODE N	
LONGITUDE OF NODE N	LATITUDE OF NODE N
TOTAL NUMBER OF NODES CONNECTED TO NODE N	
CONNECTION NODE NUMBER #1	LINK NUMBER #N-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #N-m
TOTAL LINK NUMBER L	
LINK NUMBER 1	
ROAD ATTRIBUTE INFORMATION OF LINK 1	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
:	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
:	
LINK NUMBER L	
ROAD ATTRIBUTE INFORMATION OF LINK L	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK L	
LONGITUDE OF INTERPOLATION POINT L-1	LATITUDE OF INTERPOLATION POINT L-1
:	
LONGITUDE OF INTERPOLATION POINT L-p	LATITUDE OF INTERPOLATION POINT L-p

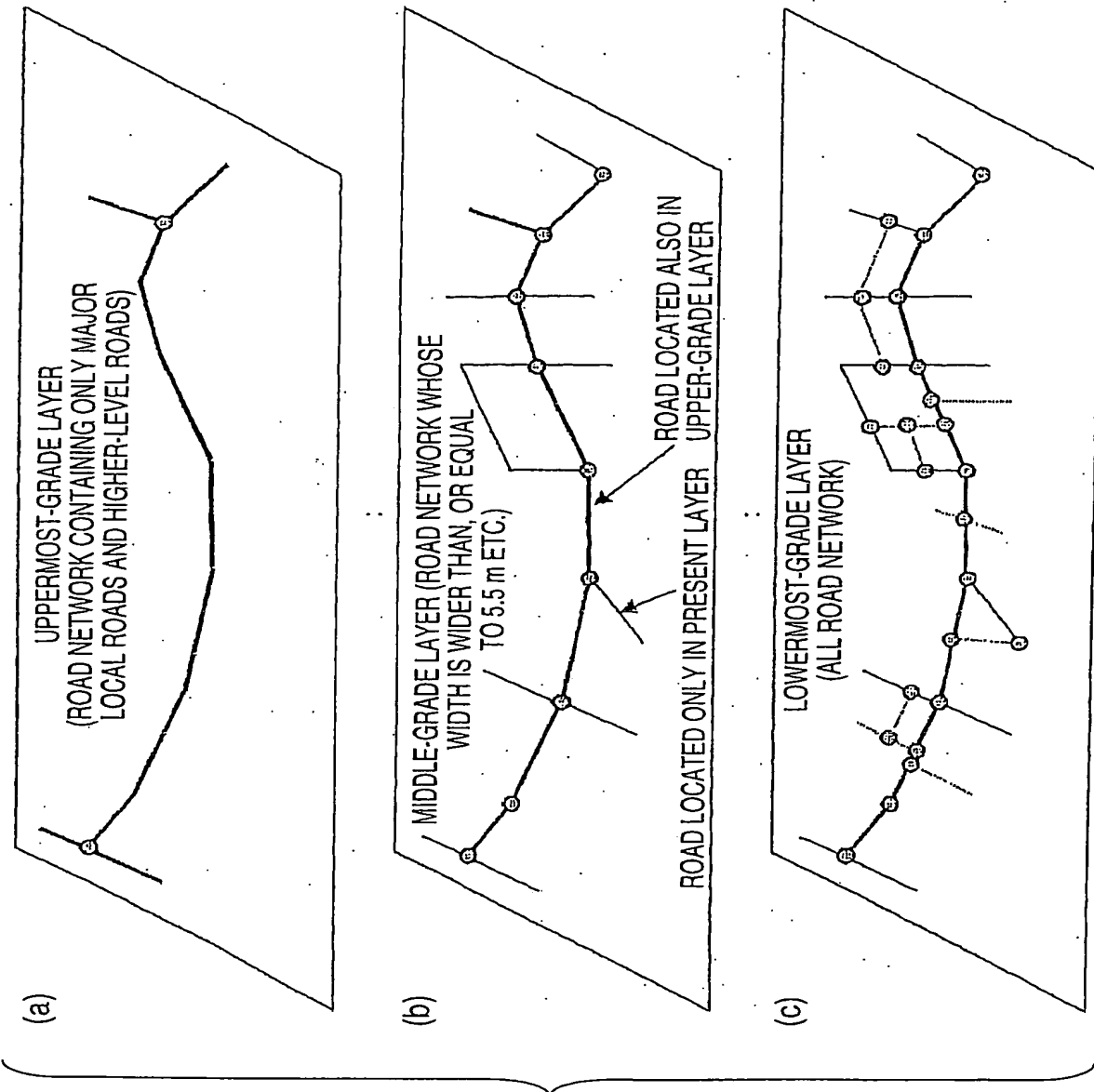


FIG. 2

FIG. 3

(a) UPPER-GRADE ROAD NETWORK DATA

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N1	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LATITUDE OF NODE 1	LONGITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #J1	LINK NUMBER #J1-1
:	
CONNECTION NODE NUMBER #Jm	LINK NUMBER #J1-m
:	
NODE NUMBER S	
NODE ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=1)	
CONNECTION NODE NUMBER #J1	LINK NUMBER #SJ1
:	
TOTAL LINK NUMBER L1	
LINK NUMBER A	
ROAD ATTRIBUTE INFORMATION OF LINK A	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK A	
LONGITUDE OF INTERPOLATION POINT A-1	LATITUDE OF INTERPOLATION POINT A-1
:	
LONGITUDE OF INTERPOLATION POINT A-p	LATITUDE OF INTERPOLATION POINT A-p
:	
LINK NUMBER SJ1	
ROAD ATTRIBUTE INFORMATION OF LINK SJ1	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK SJ1	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
:	
LONGITUDE OF INTERPOLATION POINT p	LATITUDE OF INTERPOLATION POINT p
:	

(CONT.)

(b)

## MIDDLE-GRADE ROAD NETWORK DATA

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N2	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LATITUDE OF NODE 1	LONGITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #K1	LINK NUMBER #K1-1
:	
CONNECTION NODE NUMBER #Km	LINK NUMBER #K1-m
:	
NODE NUMBER S	
NODE ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=2)	
CONNECTION NODE NUMBER #K1	LINK NUMBER #SK1
CONNECTION NODE NUMBER #K2	LINK NUMBER #SK2
:	
TOTAL LINK NUMBER L2	
LINK NUMBER B	
ROAD ATTRIBUTE INFORMATION OF LINK B	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK B	
LONGITUDE OF INTERPOLATION POINT B-1	LATITUDE OF INTERPOLATION POINT B-1
:	
LONGITUDE OF INTERPOLATION POINT B-p	LATITUDE OF INTERPOLATION POINT B-p
:	
LINK NUMBER SK2	
ROAD ATTRIBUTE INFORMATION OF LINK SK2	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK SK2	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
:	
LONGITUDE OF INTERPOLATION POINT q	LATITUDE OF INTERPOLATION POINT q
:	

(FIG. 3 CONTINUED)

(CONT.)

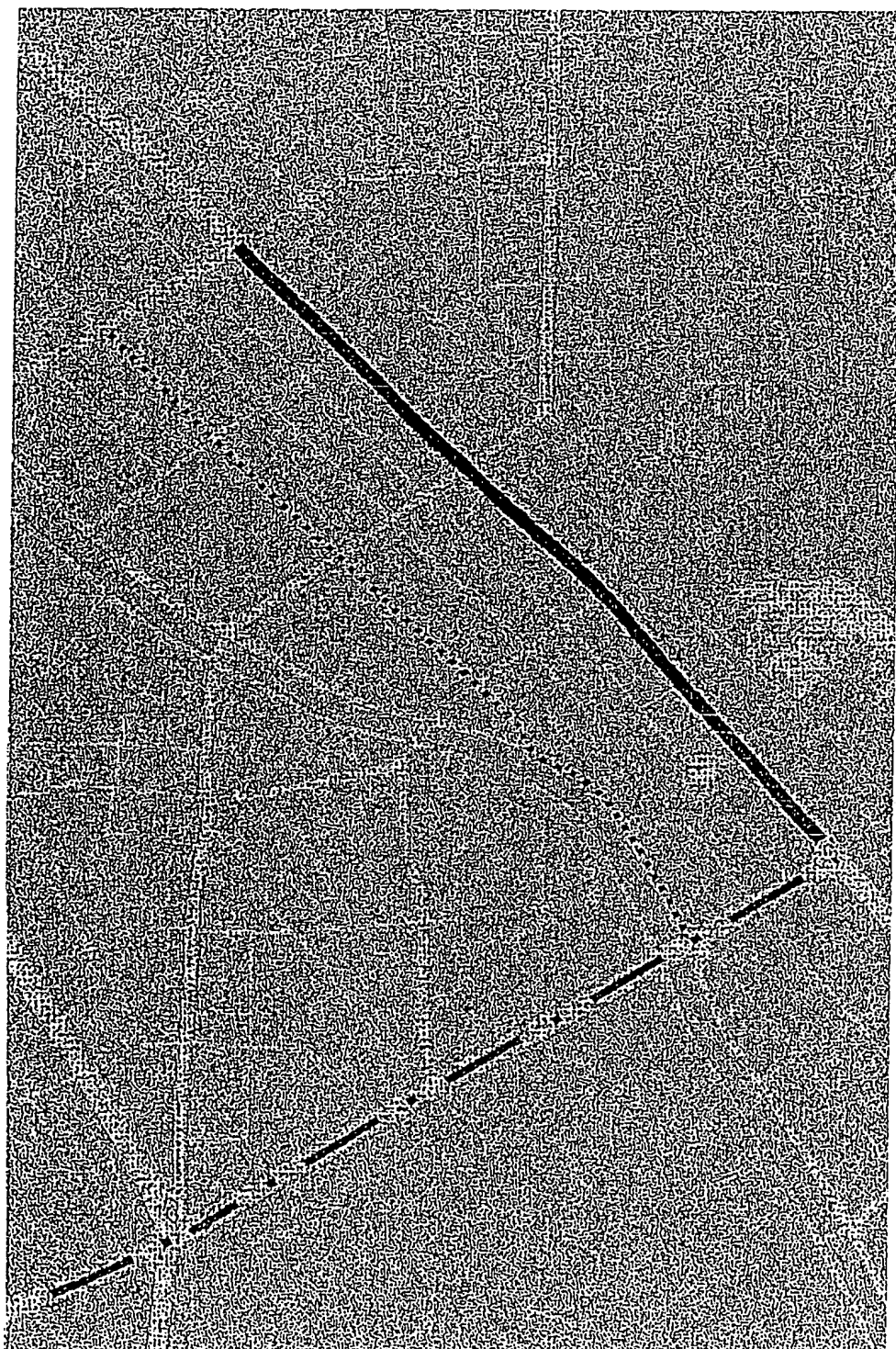
(c)

## LOWER-GRADE ROAD NETWORK DATA

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N3	
NODE NUMBER 1	
NODE ATTRIBUTE INFORMATION OF NODE 1	
LATITUDE OF NODE 1	LONGITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
:	
NODE NUMBER S	
NODE ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=3)	
CONNECTION NODE NUMBER #M1	LINK NUMBER #SM1
CONNECTION NODE NUMBER #M2	LINK NUMBER #SM2
CONNECTION NODE NUMBER #M3	LINK NUMBER #SM3
:	
TOTAL LINK NUMBER L3	
LINK NUMBER C	
ROAD ATTRIBUTE INFORMATION OF LINK C	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK C	
LONGITUDE OF INTERPOLATION POINT C-1	LATITUDE OF INTERPOLATION POINT C-1
:	
LONGITUDE OF INTERPOLATION POINT C-p	LATITUDE OF INTERPOLATION POINT C-p
:	
LINK NUMBER SM2	
ROAD ATTRIBUTE INFORMATION OF LINK SM2	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK SM2	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
:	
LONGITUDE OF INTERPOLATION POINT r	LATITUDE OF INTERPOLATION POINT r
:	

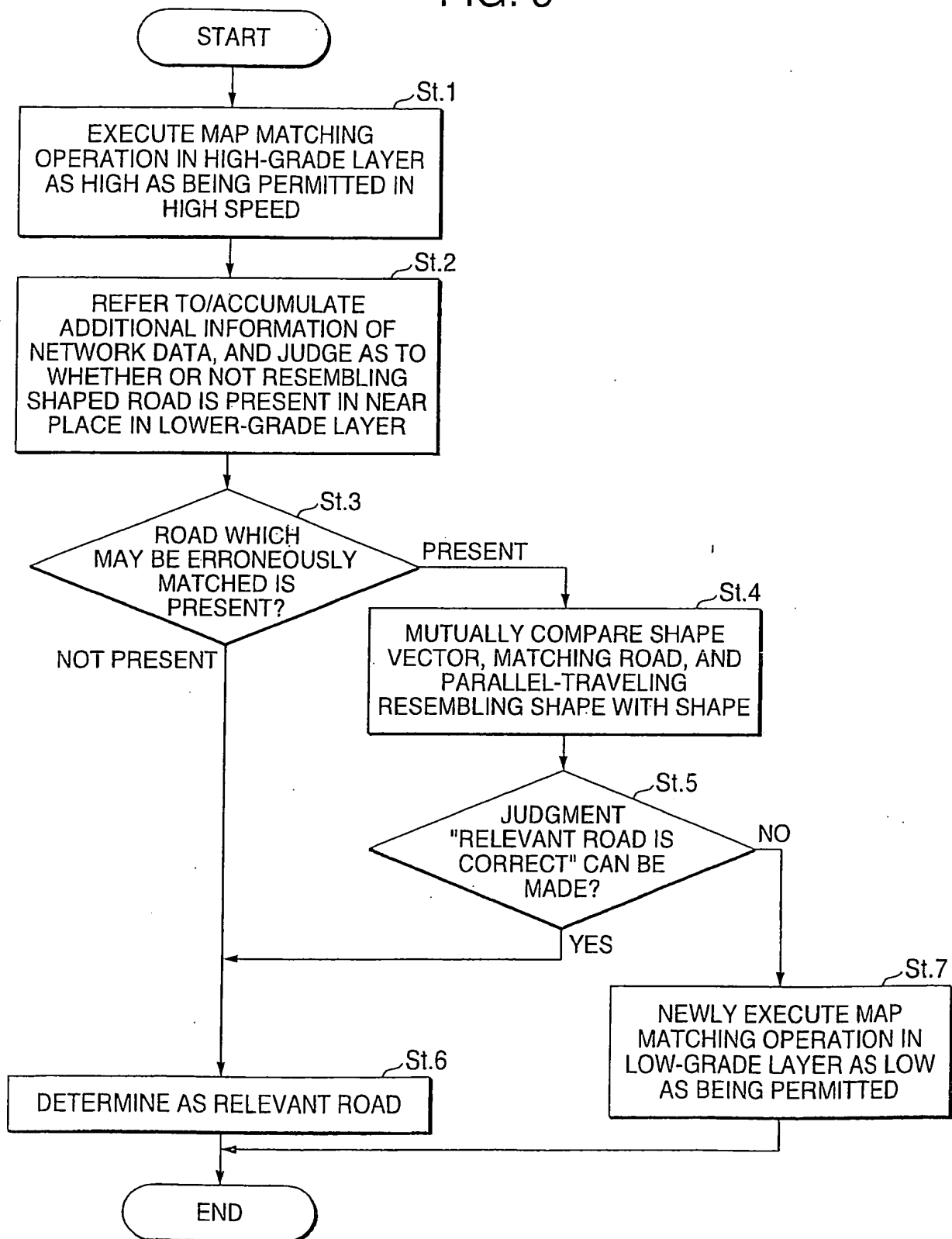
(FIG. 3(b) CONTINUED)

FIG. 4



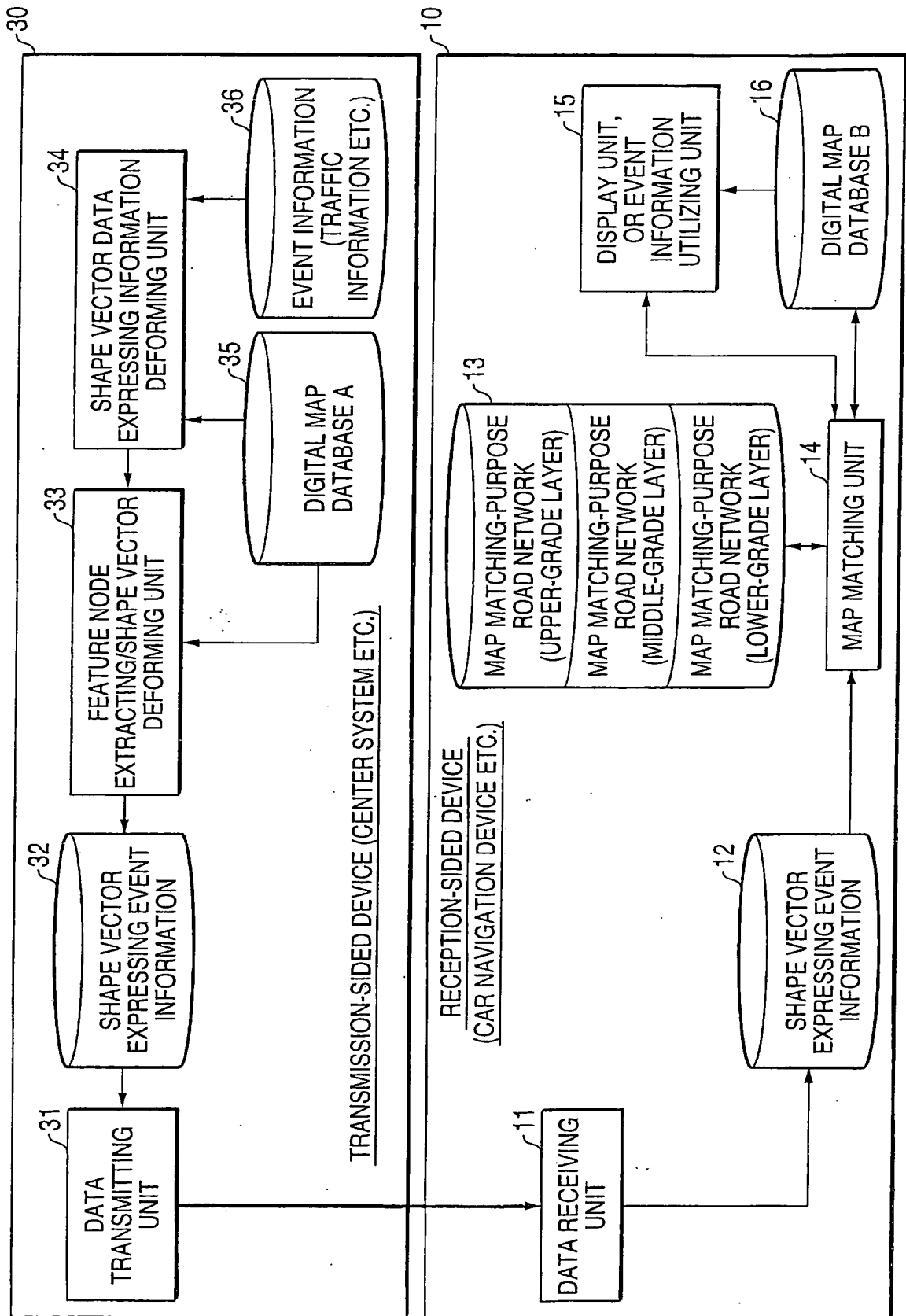
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FIG. 5



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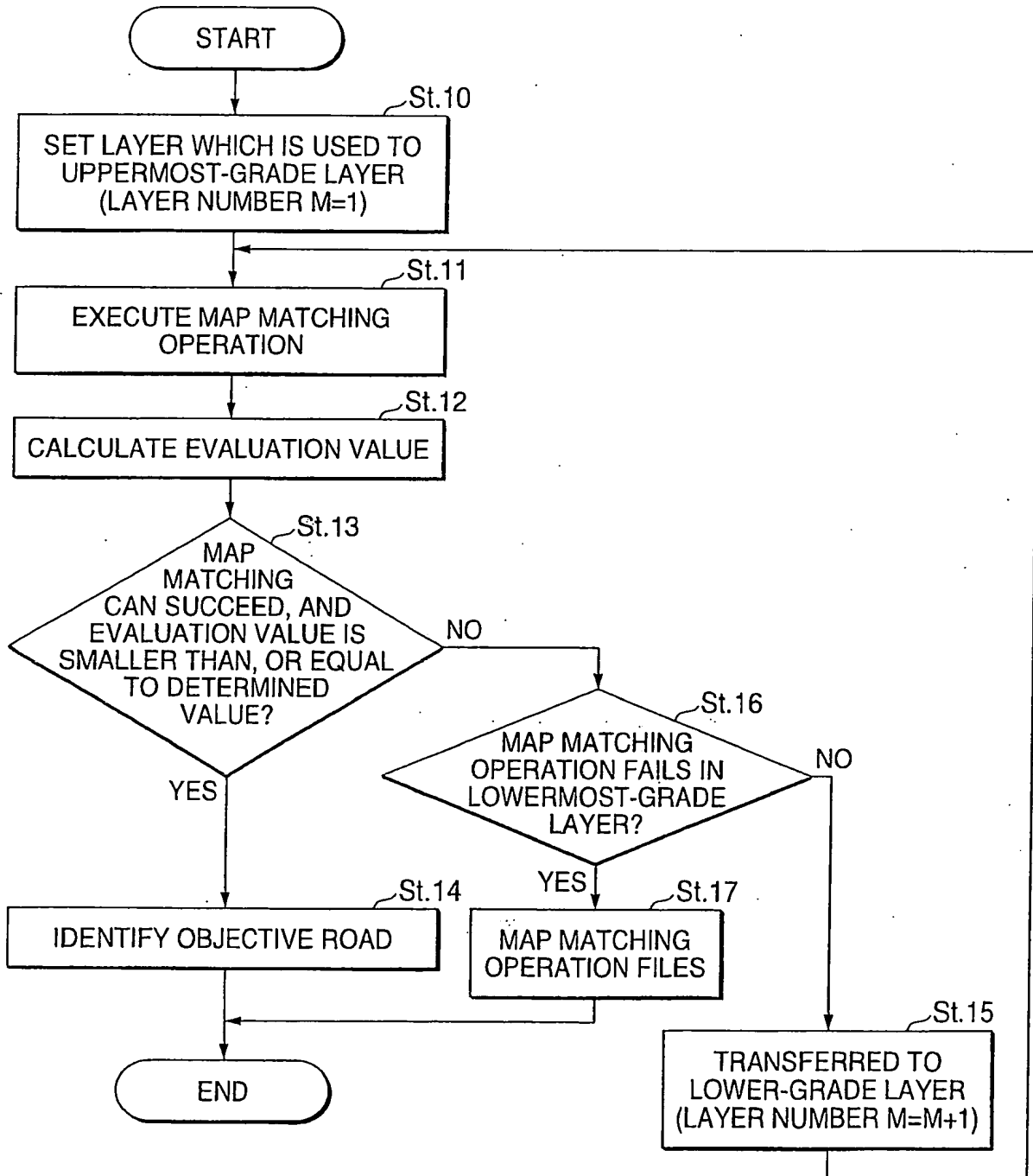
FIG. 6





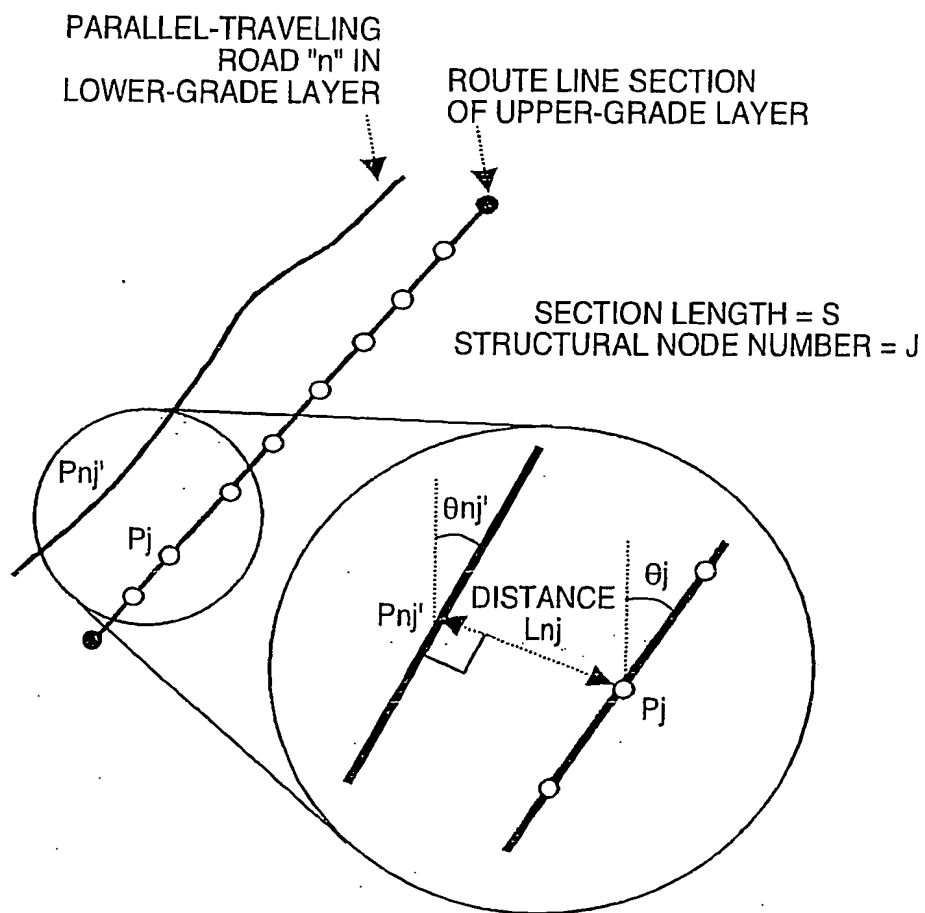
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FIG. 7



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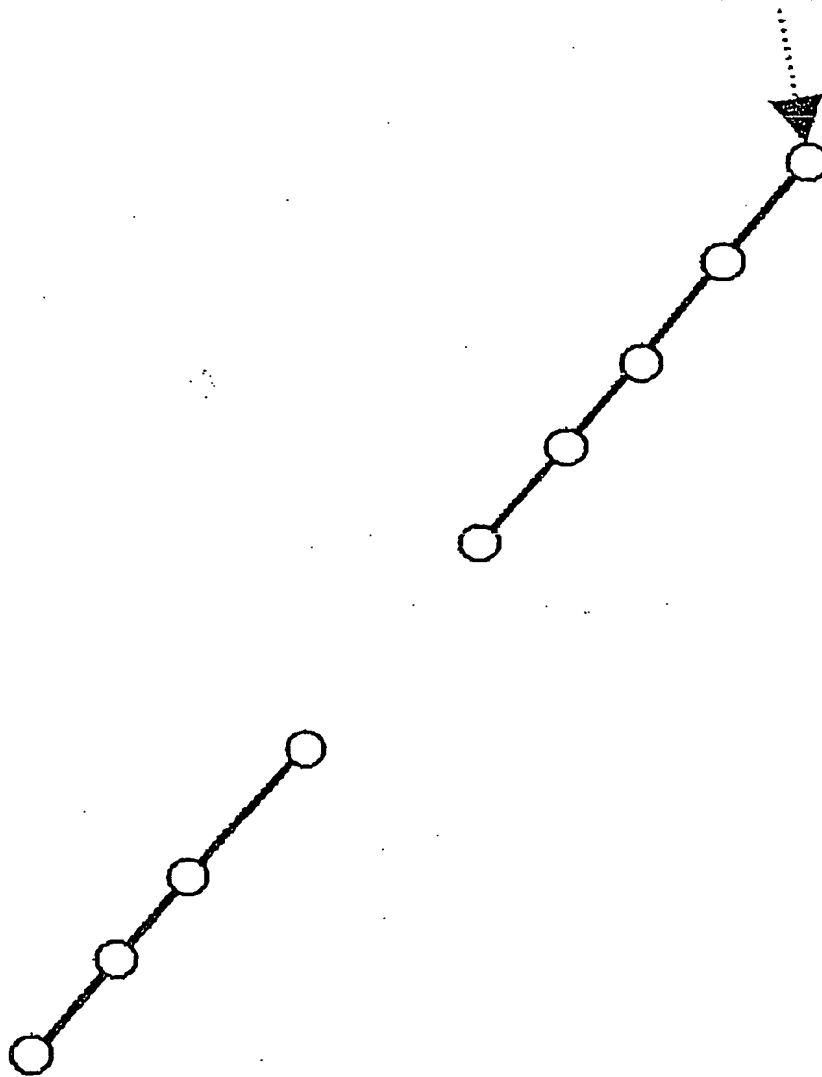
FIG. 8



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FIG. 9

EXAMPLE IN WHICH PARALLEL-TRAVELING  
ROAD IS CUT IN HALF WAY



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FIG. 10

EXAMPLE OF MAP MATCHING PURPOSE ROAD NETWORK DATA

(a)

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N	
NODE NUMBER 1	
ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
:	
TOTAL LINK NUMBER L	
LINK NUMBER 1	
ROAD ATTRIBUTE INFORMATION OF LINK 1	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK 1	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
:	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
:	
LINK NUMBER L	
ROAD ATTRIBUTE INFORMATION OF LINK L	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK L	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK L	
LONGITUDE OF INTERPOLATION POINT L-1	LATITUDE OF INTERPOLATION POINT L-1
:	
LONGITUDE OF INTERPOLATION POINT L-p	LATITUDE OF INTERPOLATION POINT L-p

(CONT.)

(b) PARALLEL-TRAVELING RESEMBLING SHAPED ROAD  
PRESENCE/ABSENCE INFORMATION  
(IN CASE THAT ONE DIRECTION IS REPRESENTED BY 1 LINK)

PRESENCE/ABSENCE OF PARALLEL-TRAVELING RESEMBLING SHAPE (PRESENCE/PRESENCE IN PARTIAL SECTION/ABSENCE)
CONNECTION/NON-CONNECTION AT UP/DOWN-STREAM SIDED INTERSECTIONS

(FIG. 10 CONTINUED)

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FIG. 11

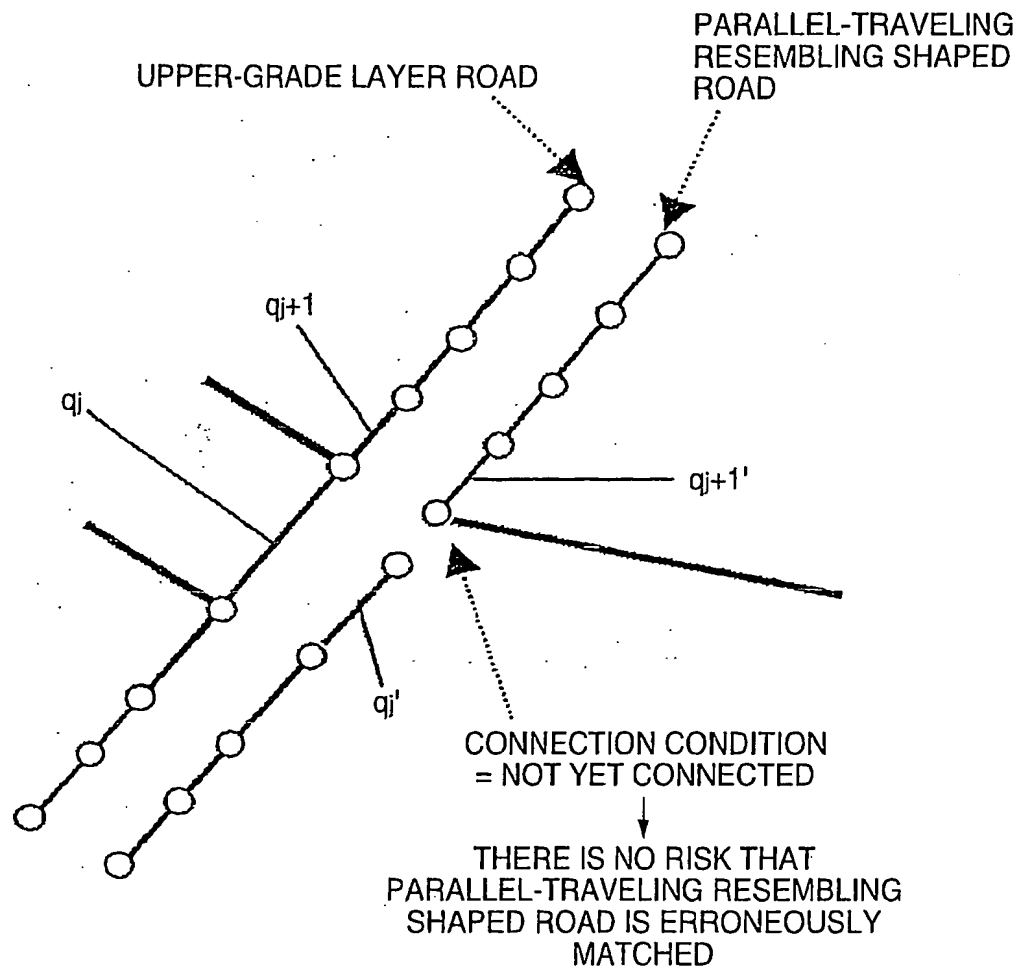


FIG. 12

EXAMPLE OF MAP MATCHING PURPOSE ROAD NETWORK DATA

(a)

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N	
NODE NUMBER 1	
ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
:	
TOTAL LINK NUMBER L	
LINK NUMBER 1	
ROAD ATTRIBUTE INFORMATION (ROAD SOAT ETC.) OF LINK 1	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK 1	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
:	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
:	
LINK NUMBER L	
ROAD ATTRIBUTE INFORMATION (ROAD SOAT ETC.) OF LINK L	
PARALLEL-TRAVELING CONNECTING SHAPE ATTRIBUTE OF LINK L	
TOTAL STRUCTURAL INTERPOLATION POINT OF LINK L	
LONGITUDE OF INTERPOLATION POINT L-1	LATITUDE OF INTERPOLATION POINT L-1
:	
LONGITUDE OF INTERPOLATION POINT L-p	LATITUDE OF INTERPOLATION POINT L-p

(CONT.)

(b)

PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE INFORMATION  
(IN CASE THAT ONE DIRECTION IS INDICATED BY 1 LINK)

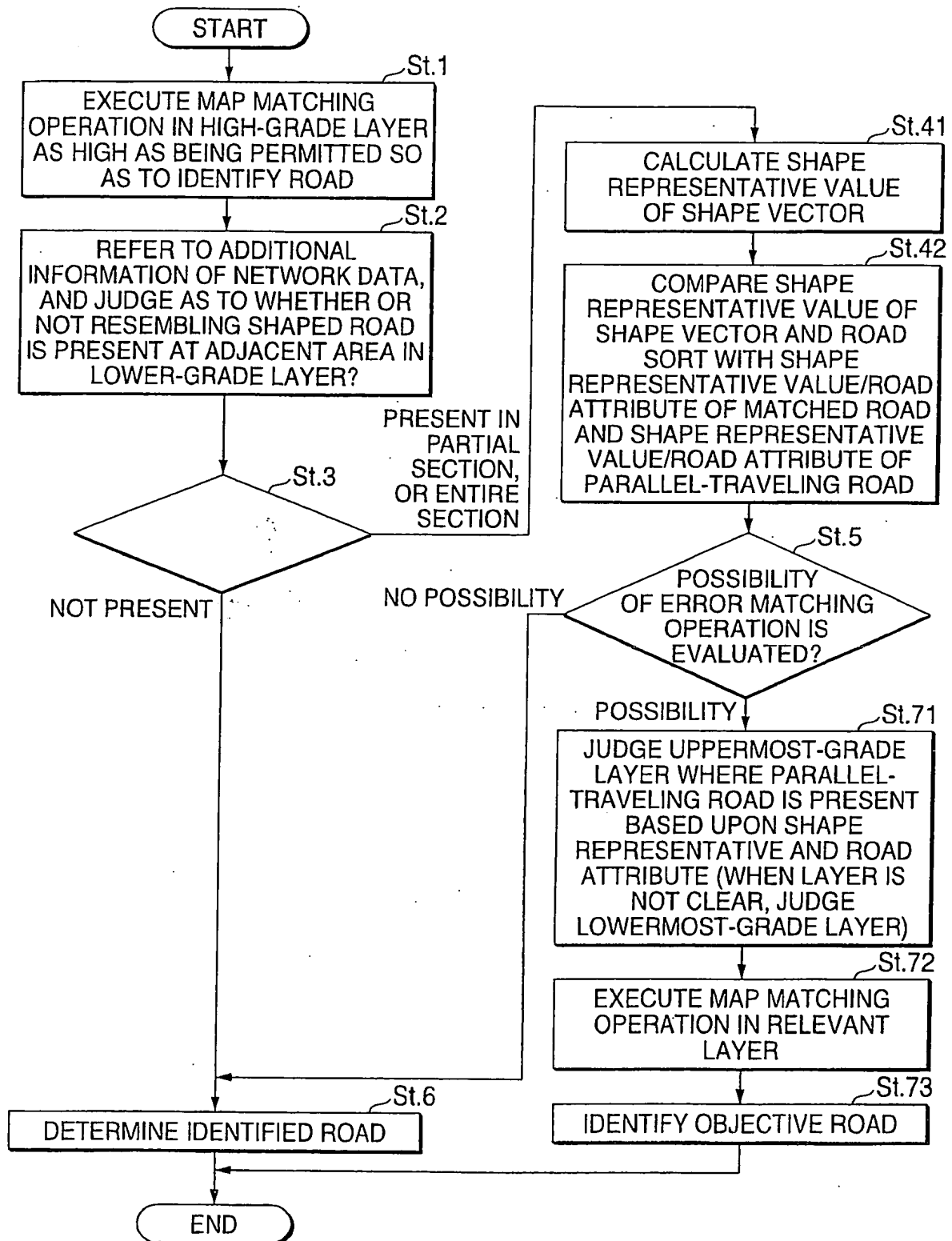
DECLINATION ACCUMULATED VALUE OF LINK 1.	
DECLINATION ABSOLUTE VALUE ACCUMULATED VALUE OF LINK 1	
TOTAL NUMBER OF PARALLEL-TRAVELING RESEMBLING SHAPES	
RESEMBLING SHAPE EVALUATION VALUE	HIERARCHICAL LAYER
ROAD ATTRIBUTE	ENTIRE/PARTIAL IDENTIFY
DECLINATION ACCUMULATED VALUE	
DECLINATION ABSOLUTE VALUE ACCUMULATED VALUE	
FLUCTUATION (STANDARD DEVIATION) WITH RESPECT TO LINK 1	
CONNECT/NOT CONNECT AT UP-STREAM SIDED INTERSECTION	
DECLINATION ABSOLUTE VALUE ACCUMULATED VALUE (MINIMUM VALUE) OF CONNECTION PORTION	
RESEMBLING SHAPE EVALUATION VALUE	HIERARCHICAL LAYER
ROAD ATTRIBUTE	ENTIRE/PARTIAL IDENTIFY
DECLINATION ACCUMULATED VALUE	
DECLINATION ABSOLUTE VALUE ACCUMULATED VALUE	
FLUCTUATION (STANDARD DEVIATION) WITH RESPECT TO LINK 1	
CONNECT/NON-CONNECT FLAG TO UP-STREAM SIDED INTERSECTION	
DECLINATION ABSOLUTE VALUE ACCUMULATED VALUE (MINIMUM VALUE) OF CONNECTION PORTION	

(FIG. 12 CONTINUED)



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FIG. 13



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FIG. 14

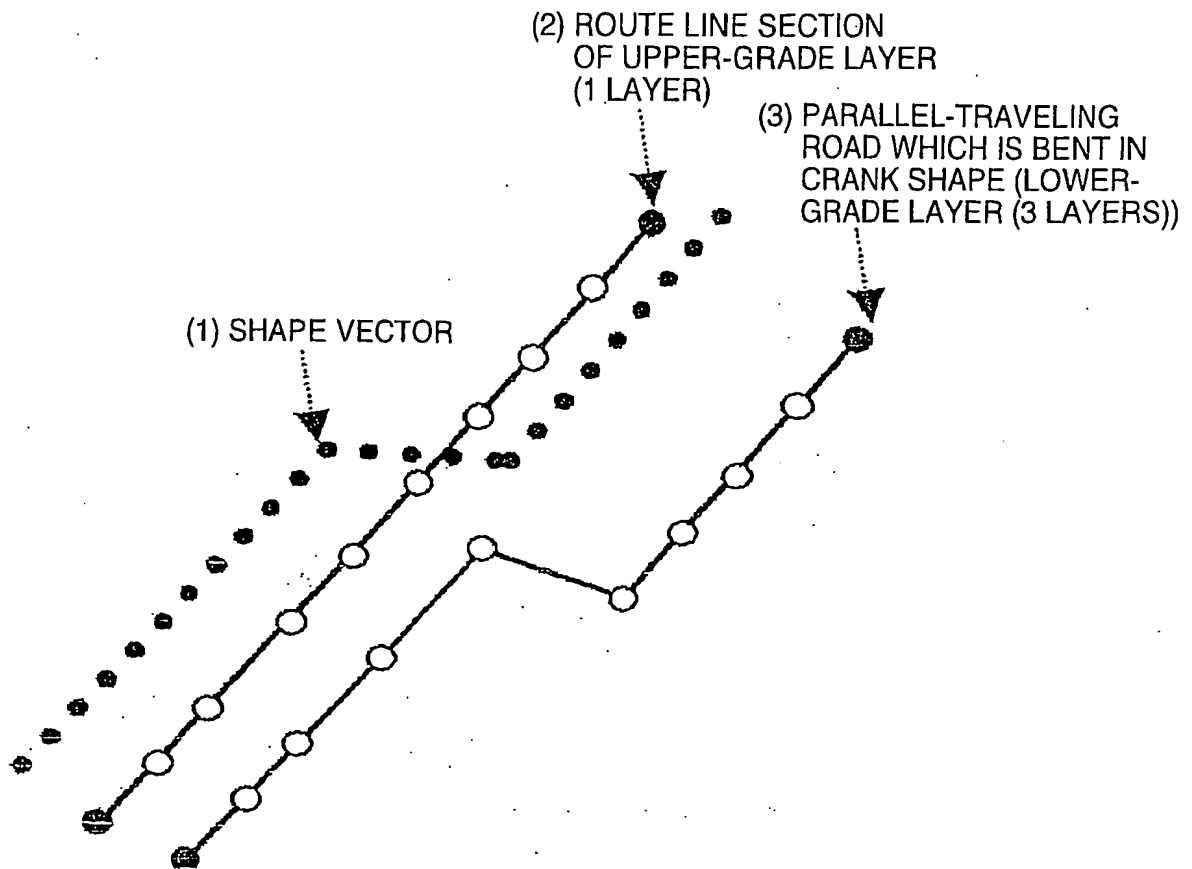
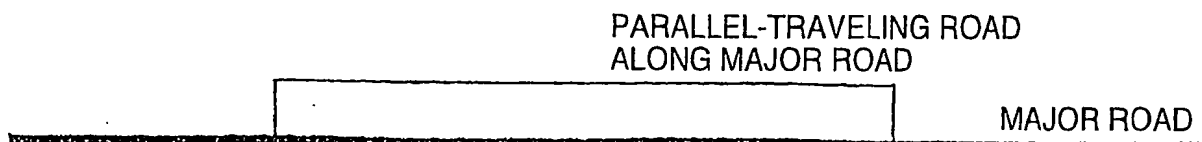


FIG. 15

EXAMPLE IN WHICH PARALLEL-TRAVELING  
ROAD IS PRESENT IN PARTIAL SECTION



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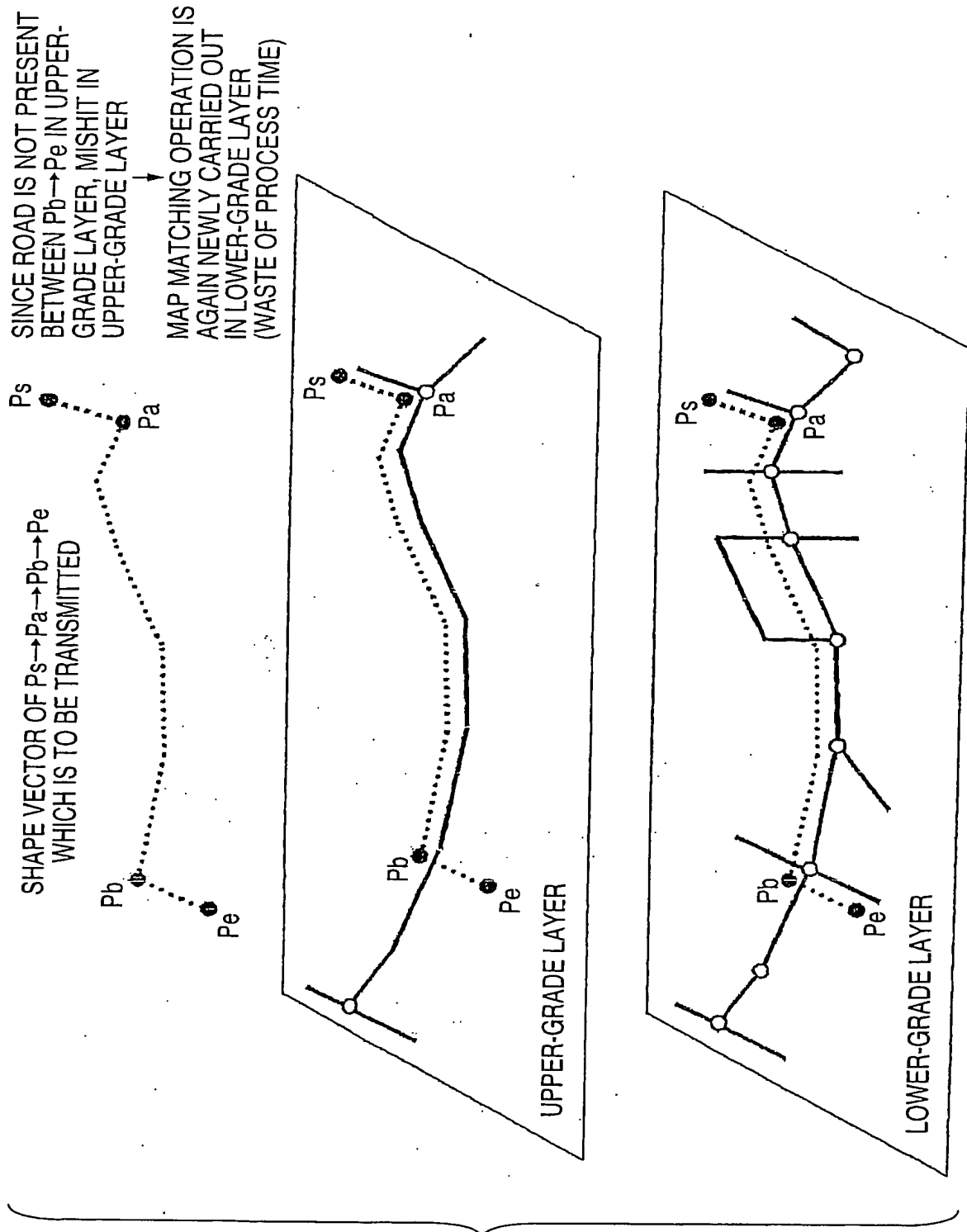
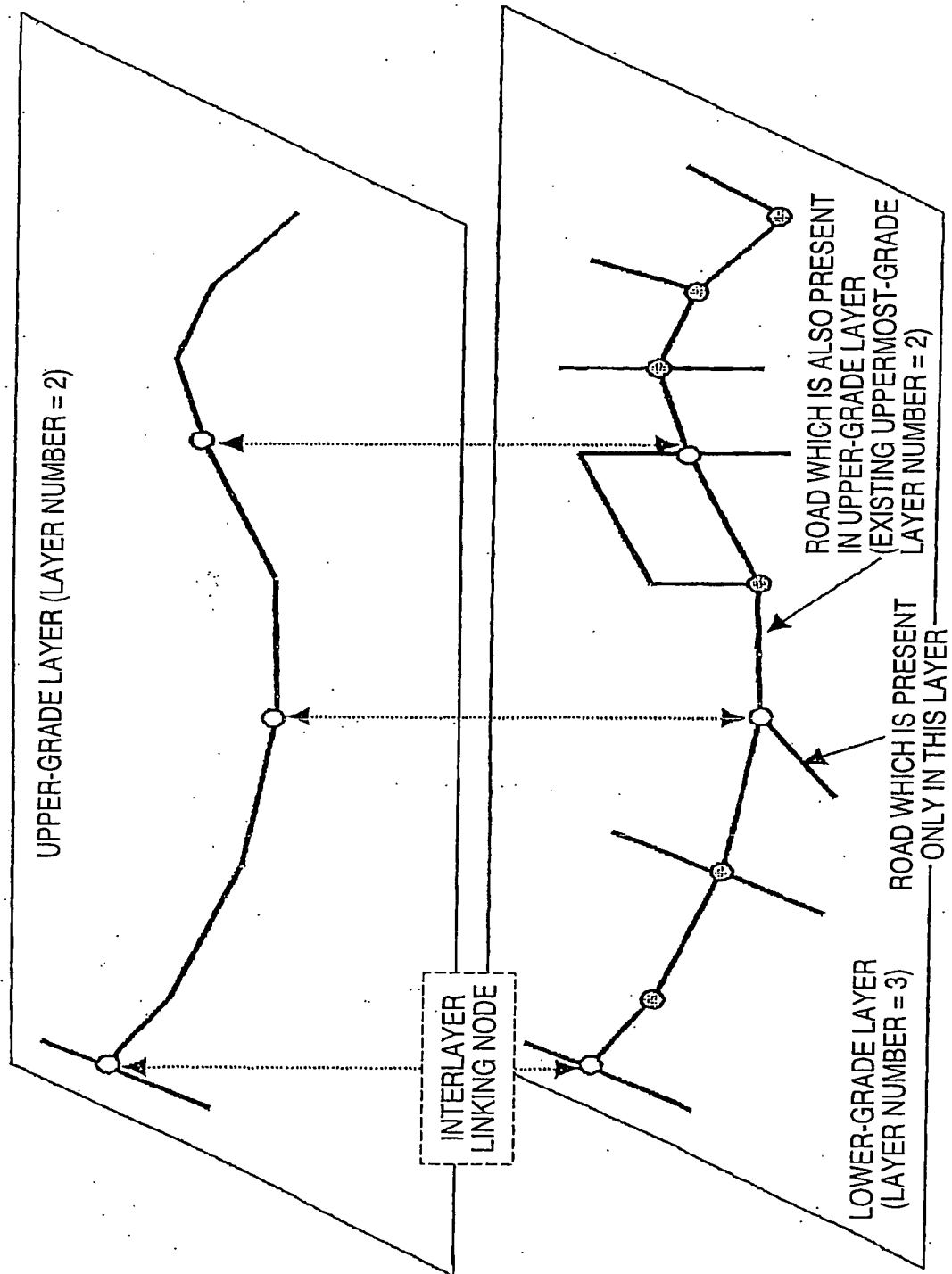


FIG. 16

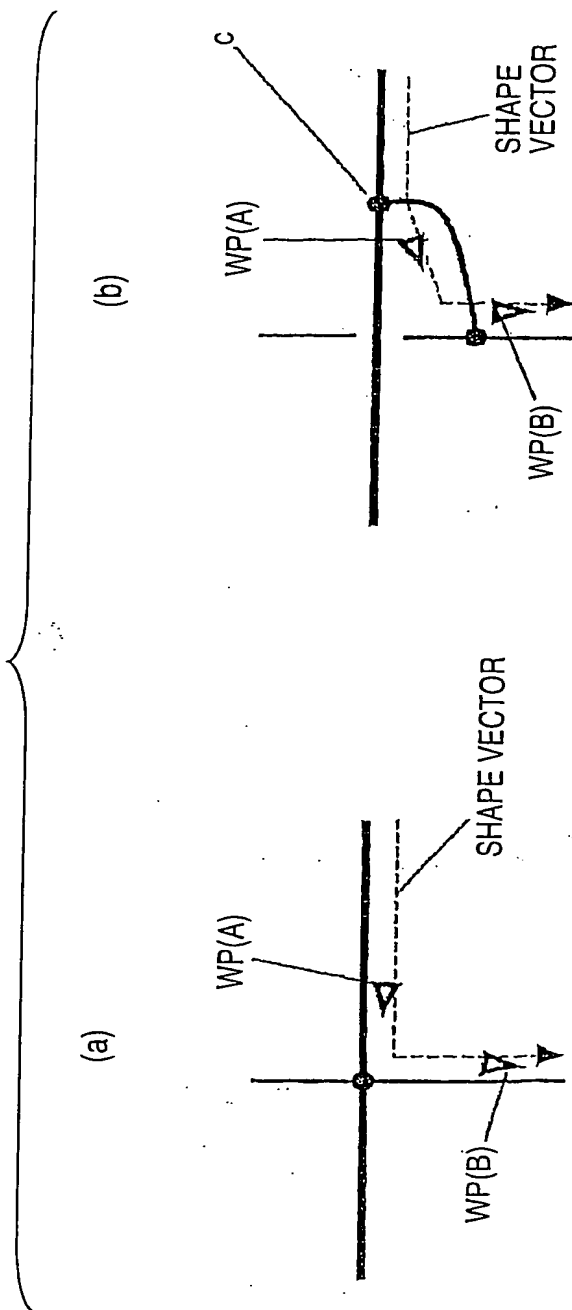
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FIG. 17



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FIG. 18



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FIG. 19

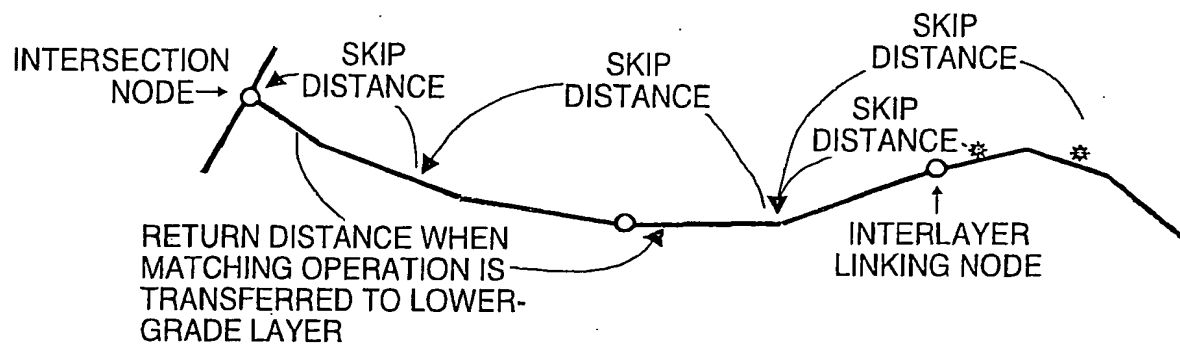


FIG. 20

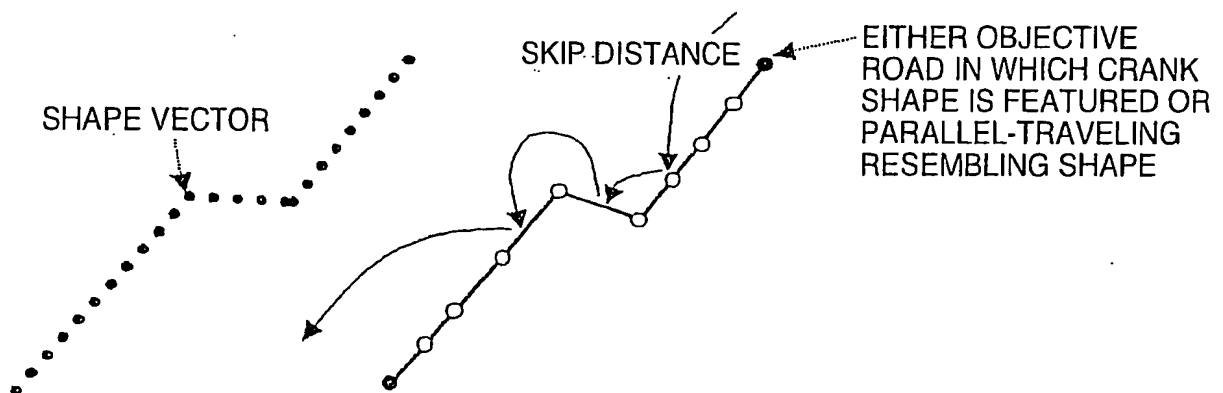
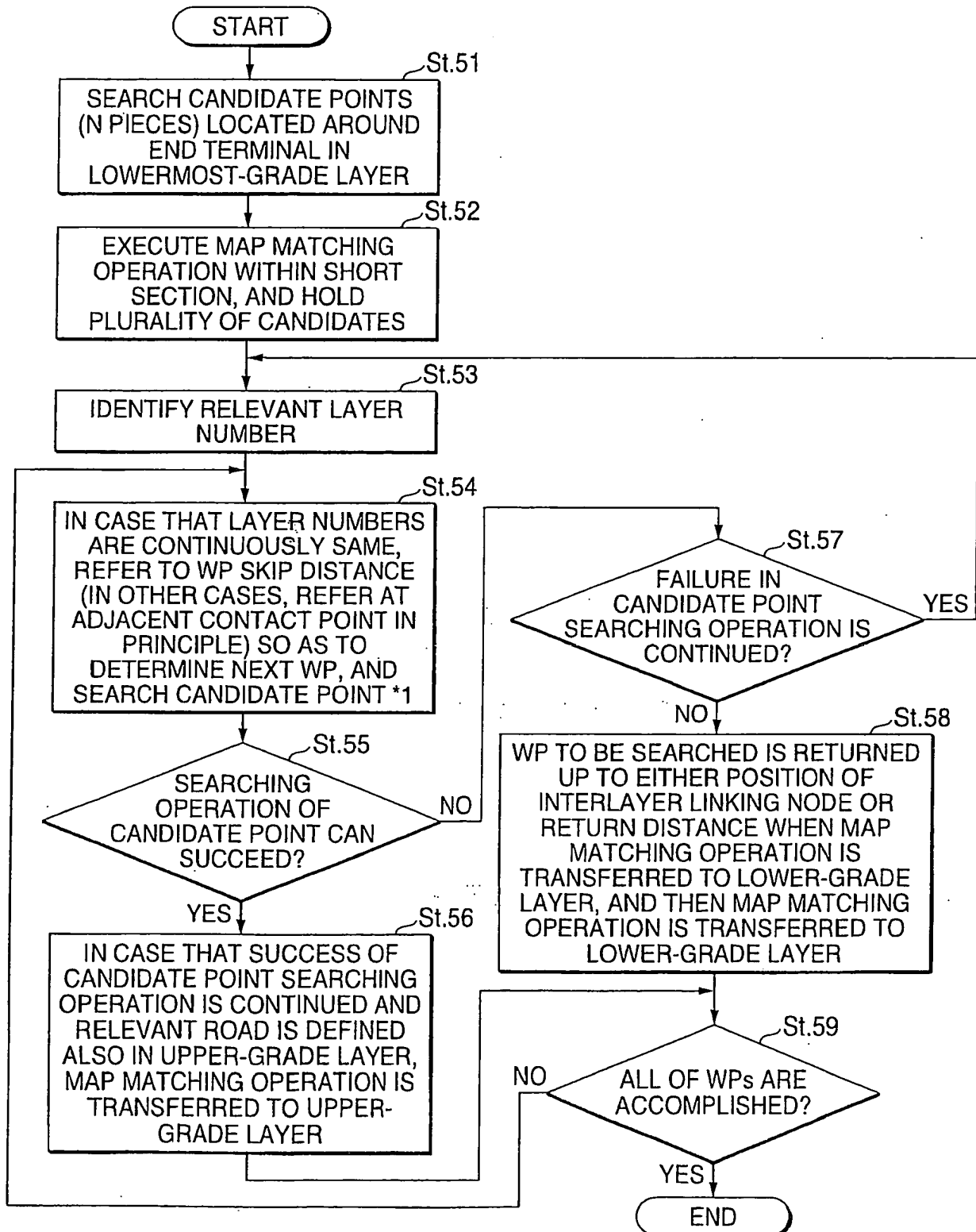


FIG. 21

HEADER INFORMATION (HIERARCHICAL NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N	
NODE NUMBER 1	
ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
:	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
:	
TOTAL LINK NUMBER L	
LINK NUMBER 1	
ROAD ATTRIBUTE INFORMATION OF LINK 1	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK 1	
UPPERMOST-GRADE LAYER NUMBER OF PRESENT ROAD	
TOTAL STRUCTURAL INTERPOLATION POINT OF LINK 1	
LONGITUDE OF INTERPOLATION POINT 1-1	LATITUDE OF INTERPOLATION POINT 1-1
RECOMMENDED SKIP DISTANCE IN LINK BETWEEN 1-1 AND 1-2 (RETURN DISTANCE IN LINK BETWEEN 1-1 AND 1-2 WHEN MAP MATCHING OPERATION IS TRANSFERRED TO LOWER-GRADE LAYER)	
LONGITUDE OF INTERPOLATION POINT 1-2	LATITUDE OF INTERPOLATION POINT 1-2
:	
LONGITUDE OF INTERPOLATION POINT 1-p	LATITUDE OF INTERPOLATION POINT 1-p
:	

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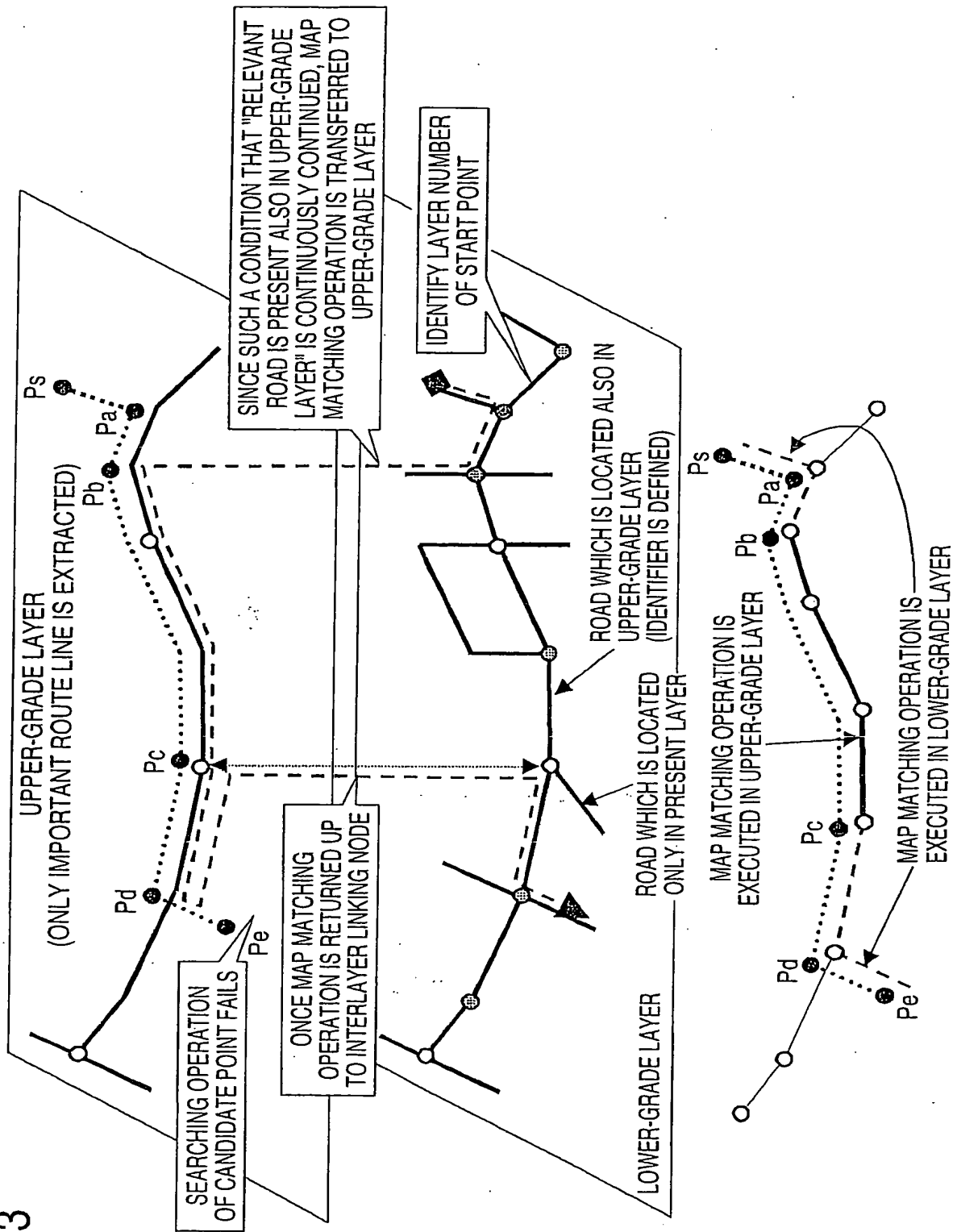
FIG. 22





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FIG. 23



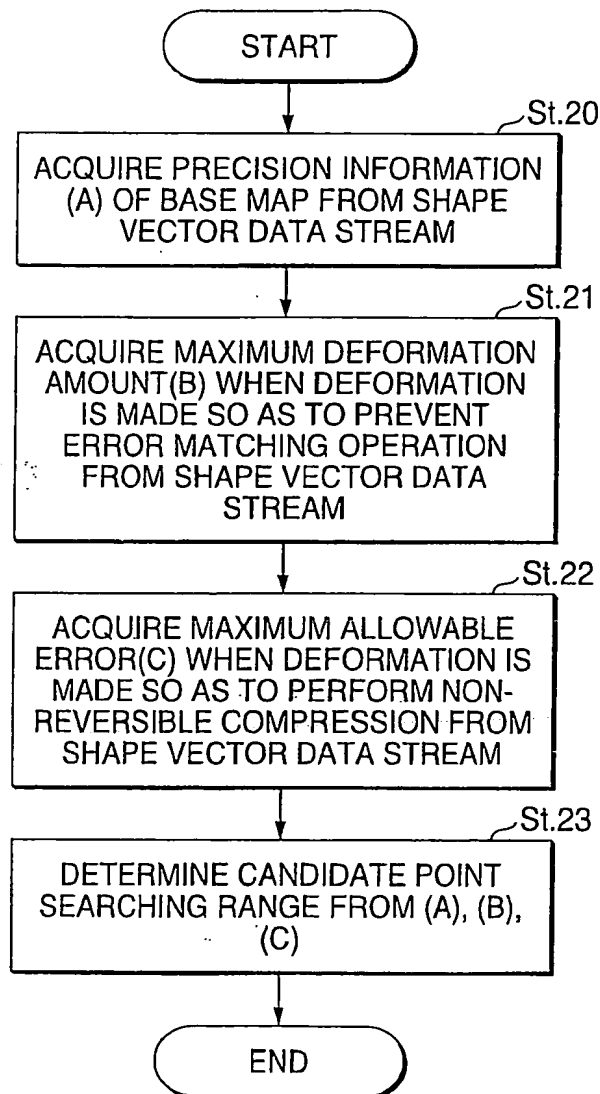
## FIG. 24

## SHAPE VECTOR DATA STREAM

BASE MAP PRECISION INFORMATION OF SHAPE VECTOR
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 1
ROAD ATTRIBUTE
MAXIMUM DEFORMATION AMOUNT [m] WHEN DEFORMATION IS MADE SO AS TO PREVENT ERRONEOUS MAP MATCHING OPERATION
MAXIMUM ALLOWABLE ERROR AMOUNT [m] WHEN NON- REVERSIBLE COMPRESSING OPERATION IS CARRIED OUT
TOTAL NODE NUMBER OF SHAPE DATA AFTER COMPRESSING OPERATION
NODE NUMBER p1
X-DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
Y-DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
SHAPE DATA WHICH HAS BEEN NONREVERSIBLE-COMPRESSED
⋮ ⋮
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 100
⋮ ⋮
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = ZZ
⋮ ⋮

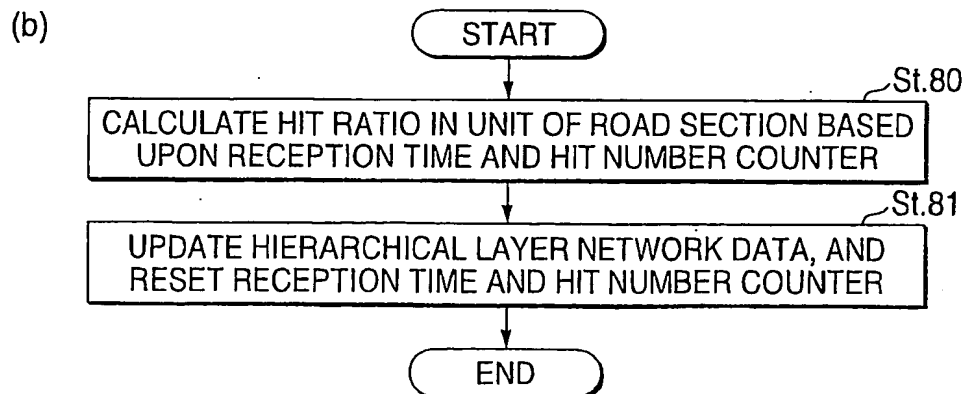
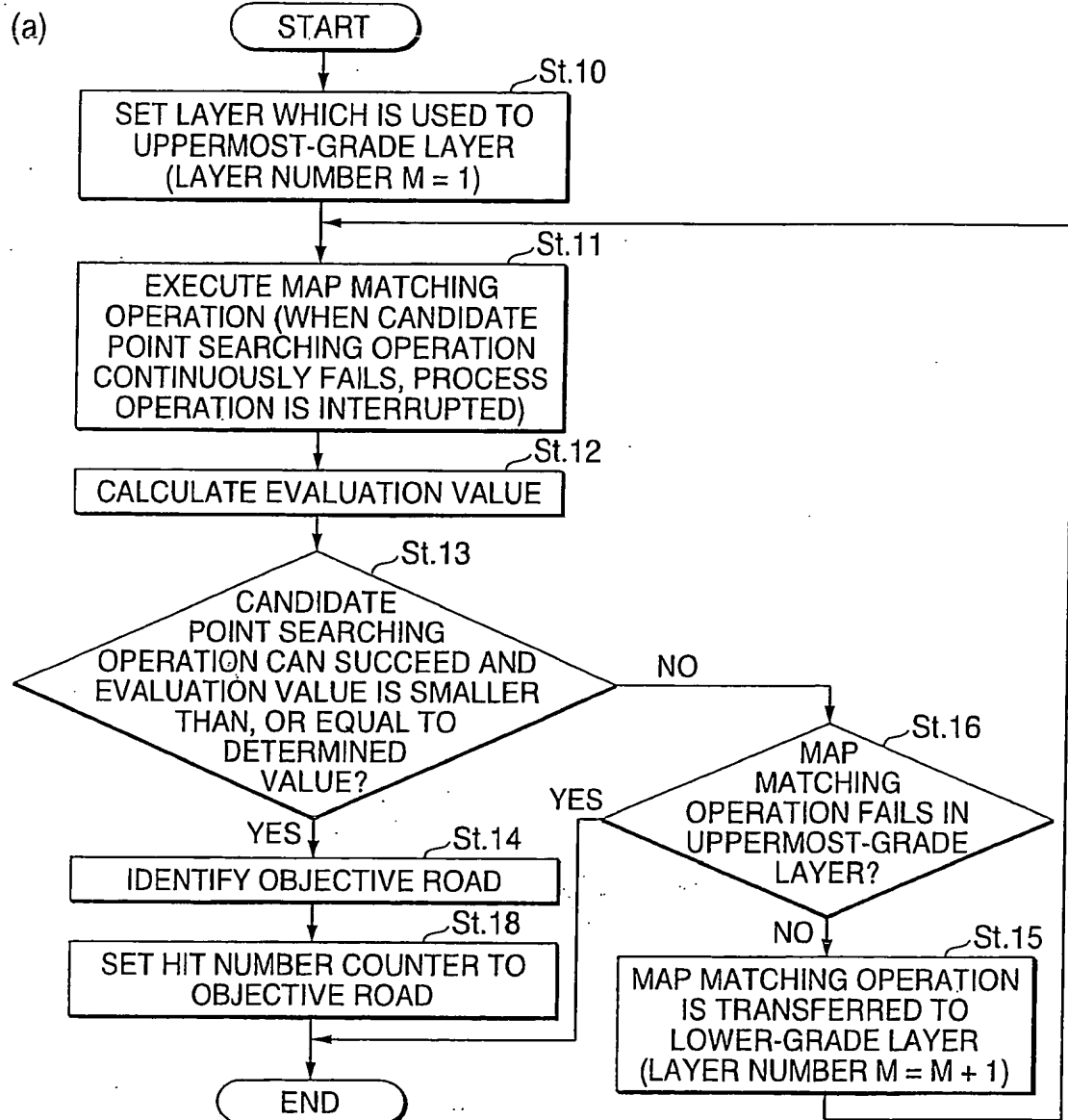
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FIG. 25



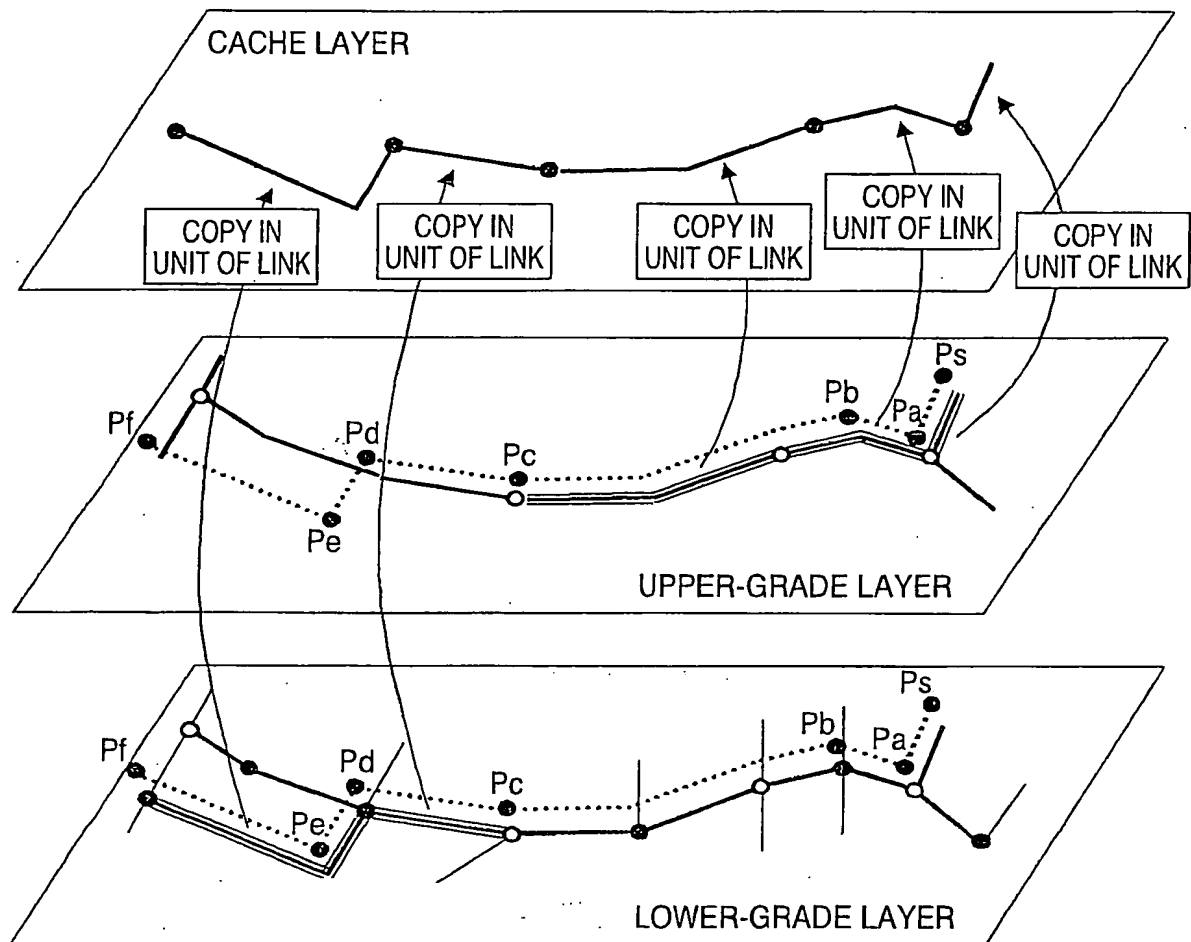
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FIG. 26



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FIG. 27



≡ : LINK WHICH IS HIT IN RELEVANT LAYER

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FIG. 28

## UPPER-GRADE ROAD NETWORK DATA

(a)

HEADER INFORMATION (HIERARCHICAL LAYER NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N1	
NODE NUMBER 1	
ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #J1	LINK NUMBER #J1-1
⋮	
CONNECTION NODE NUMBER #Jm	LINK NUMBER #J1-m
⋮	
NODE NUMBER S	
NODE ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=2)	
CONNECTION NODE NUMBER #J1	LINK NUMBER #SJ1
CONNECTION NODE NUMBER #J2	LINK NUMBER #SJ2
⋮	
TOTAL LINK NUMBER L1	
LINK NUMBER A	
ROAD ATTRIBUTE INFORMATION OF LINK A	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK A	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK A	
LONGITUDE OF INTERPOLATION POINT A-1	LATITUDE OF INTERPOLATION POINT A-1
⋮	
LONGITUDE OF INTERPOLATION POINT A-p	LATITUDE OF INTERPOLATION POINT A-p
⋮	
LINK NUMBER SJ1	
ROAD ATTRIBUTE INFORMATION OF LINK SJ1	
PARALLEL-TRAVELING CONNECTING SHAPE ATTRIBUTE OF LINK SJ1	
TOTAL STRUCTURAL INTERPOLATION POINT OF LINK SJ1	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
⋮	
LONGITUDE OF INTERPOLATION POINT p	LATITUDE OF INTERPOLATION POINT p
⋮	

(CONT.)

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(b)

## LOWER-GRADE ROAD NETWORK DATA

HEADER INFORMATION (HIERARCHICAL LAYER NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N1	
NODE NUMBER 1	
ATTRIBUTE INFORMATION OF NODE 1	
LONGITUDE OF NODE 1	LATITUDE OF NODE 1
TOTAL NUMBER OF NODES CONNECTED TO NODE 1	
CONNECTION NODE NUMBER #1	LINK NUMBER #1-1
⋮	
CONNECTION NODE NUMBER #m	LINK NUMBER #1-m
⋮	
NODE NUMBER S	
NODE ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=3)	
CONNECTION NODE NUMBER #K1	LINK NUMBER #SK1
CONNECTION NODE NUMBER #K2	LINK NUMBER #SK2
CONNECTION NODE NUMBER #K3	LINK NUMBER #SK3
⋮	
TOTAL LINK NUMBER L2	
LINK NUMBER B	
ROAD ATTRIBUTE INFORMATION OF LINK B	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK B	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK B	
LONGITUDE OF INTERPOLATION POINT B-1	LATITUDE OF INTERPOLATION POINT B-1
⋮	
LONGITUDE OF INTERPOLATION POINT B-p	LATITUDE OF INTERPOLATION POINT B-p
⋮	
LINK NUMBER SK2	
ROAD ATTRIBUTE INFORMATION OF LINK SK2	
PARALLEL-TRAVELING CONNECTING SHAPE ATTRIBUTE OF LINK SK2	
TOTAL STRUCTURAL INTERPOLATION POINT OF LINK SK2	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
⋮	
LONGITUDE OF INTERPOLATION POINT p'	LATITUDE OF INTERPOLATION POINT p'
⋮	

(FIG. 28 CONTINUED)

(CONT.)

- (c) CACHE LAYER ROAD NETWORK DATA (HATCHED PORTIONS OF UPPER-GRADE/LOWER-GRADE LAYER DATA ARE COPIED, AND EVERY TIME TOTAL NUMBER OF NODES IS CALCULATED, CACHE LAYER ROAD NETWORK DATA IS PRODUCED)

HEADER INFORMATION (HIERARCHICAL LAYER NUMBER/SECTION DEFINITION ETC.)	
TOTAL NODE NUMBER N (SEQUENTIALLY ADD EVERY COPY)	
⋮	
NODE NUMBER S	
ATTRIBUTE INFORMATION OF NODE S	
LONGITUDE OF NODE S	LATITUDE OF NODE S
TOTAL NUMBER OF NODES CONNECTED TO NODE S (=2)	
CONNECTION NODE NUMBER #J1	LINK NUMBER #SJ1
CONNECTION NODE NUMBER #K2	LINK NUMBER #SK2
⋮	
TOTAL LINK NUMBER L (SEQUENTIALLY ADD EVERY COPY)	
⋮	
LINK NUMBER SJ1	
ROAD ATTRIBUTE INFORMATION OF LINK SJ1	
PARALLEL-TRAVELING RESEMBLING SHAPE ATTRIBUTE OF LINK SJ1	
TOTAL STRUCTURAL INTERPOLATION POINT OF LINK SJ1	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
⋮	
LONGITUDE OF INTERPOLATION POINT p	LATITUDE OF INTERPOLATION POINT p
⋮	
LINK NUMBER SK2	
ROAD ATTRIBUTE INFORMATION OF LINK SK2	
PARALLEL-TRAVELING CONNECTING SHAPE ATTRIBUTE OF LINK SK2	
TOTAL STRUCTURAL INTERPOLATION POINT NUMBER OF LINK SK2	
LONGITUDE OF INTERPOLATION POINT 1	LATITUDE OF INTERPOLATION POINT 1
⋮	
LONGITUDE OF INTERPOLATION POINT p	LATITUDE OF INTERPOLATION POINT p
⋮	

(FIG. 28(b) CONTINUED)



FIG. 29

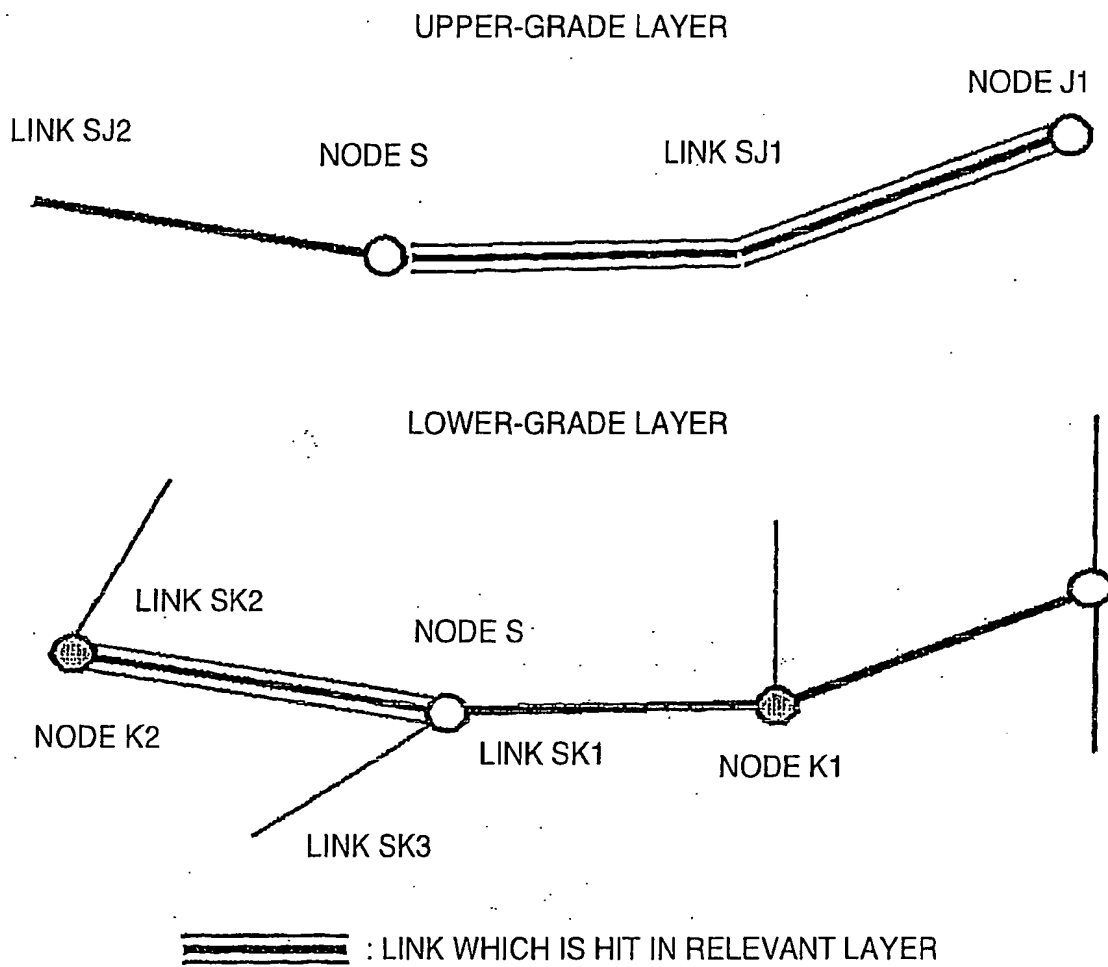


FIG. 30

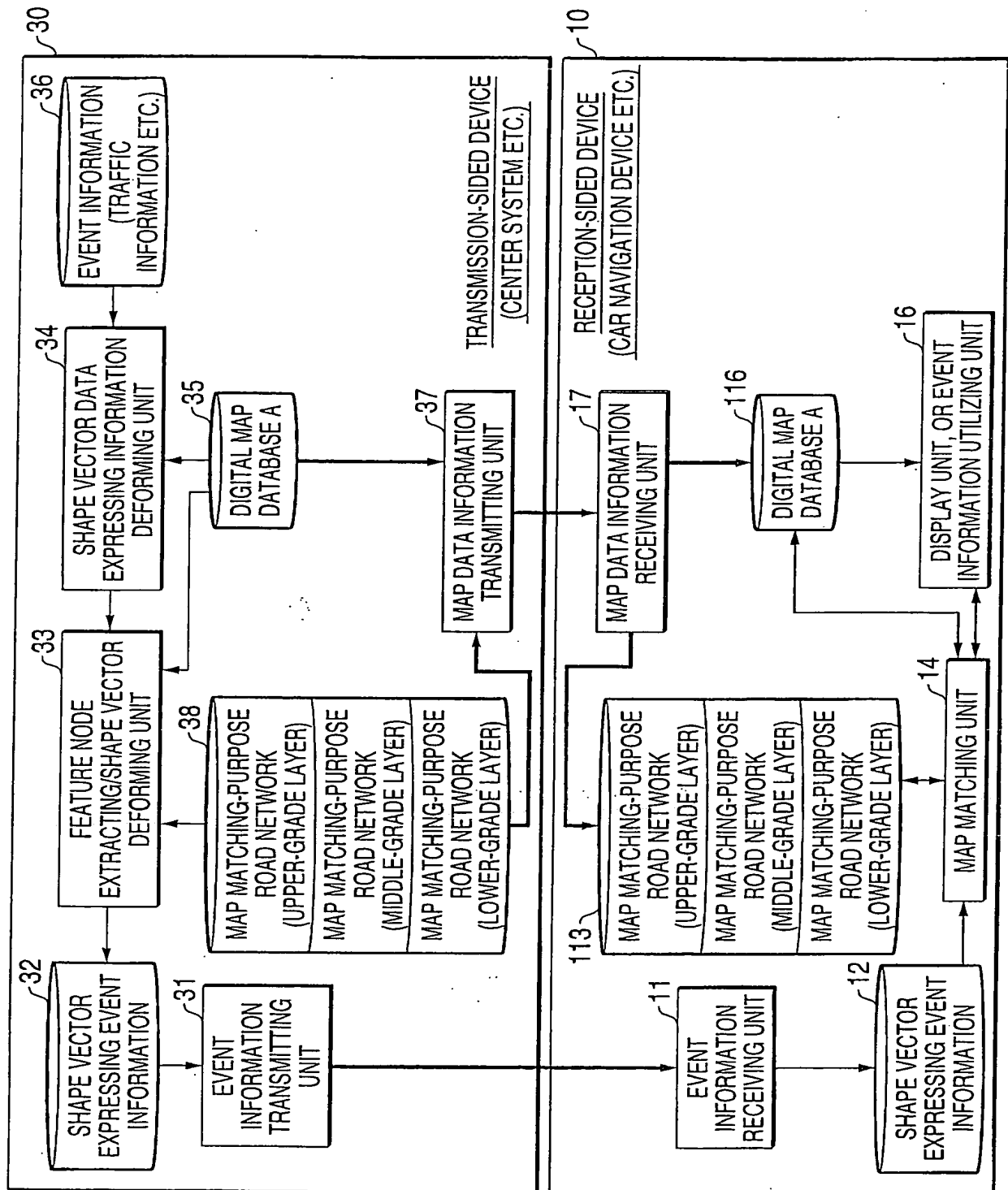


FIG. 31

EXAMPLE 1, SHAPE VECTOR DATA STREAM (HIERARCHICAL LAYER JUDGING INFORMATION IS ADDED IN UNIT OF SHAPE VECTOR)

(a)

SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 1
HIERARCHICAL LAYER NUMBER
ROAD ATTRIBUTE (ROAD SORT ETC.)
TOTAL NODE NUMBER
NODE NUMBER p1
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
ABSOLUTE AZIMUTH OF NODE 1
:
NODE NUMBER pN
RELATIVE COORDINATE (x <sub>n</sub> ) OF NODE N
RELATIVE COORDINATE (y <sub>n</sub> ) OF NODE N
RELATIVE AZIMUTH OF NODE N
:
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 100
:
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = ZZ
:

(CONT.)

(b) EXAMPLE 2, SHAPE VECTOR DATA STREAM (HIERARCHICAL LAYER JUDGING INFORMATION IS ADDED IN UNIT OF NODE)

SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 1	
TOTAL NODE NUMBER	
NODE NUMBER p1	
HIERARCHICAL LAYER NUMBER OF NODE 1	ROAD ATTRIBUTE OF NODE 1
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1	
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1	
ABSOLUTE AZIMUTH OF NODE 1	
⋮	
NODE NUMBER pN	
HIERARCHICAL LAYER NUMBER OF NODE N	ROAD ATTRIBUTE OF NODE N
RELATIVE COORDINATE ( $x_n$ ) OF NODE N	
RELATIVE COORDINATE ( $y_n$ ) OF NODE N	
RELATIVE AZIMUTH OF NODE N	
⋮	
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 100	
⋮	
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = ZZ	
⋮	

(FIG. 31 CONTINUED)

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FIG. 32

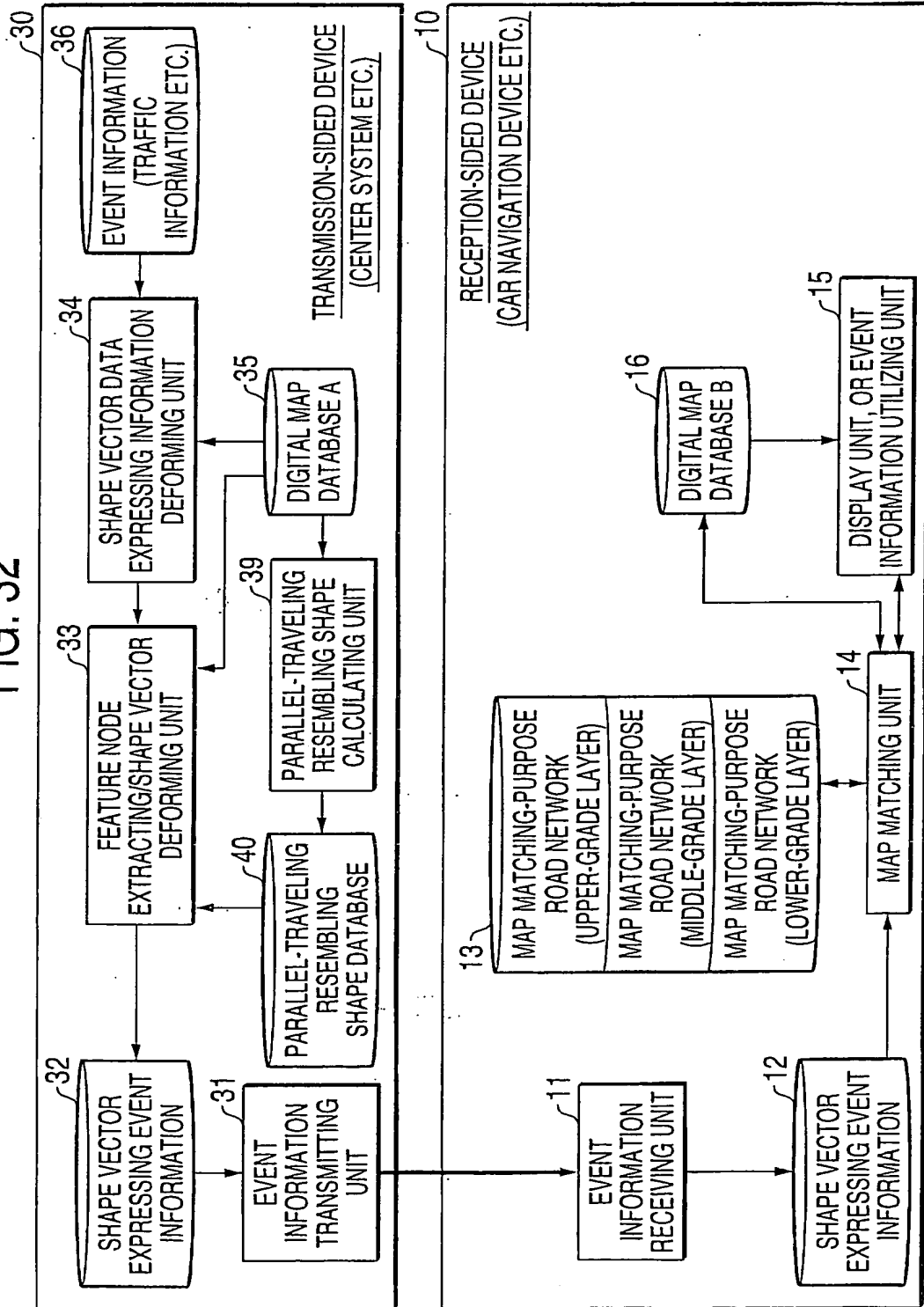


FIG. 33

< PARALLEL-TRAVELING RESEMBLING  
SHAPE EXTRACTING PROCESS OPERATION >

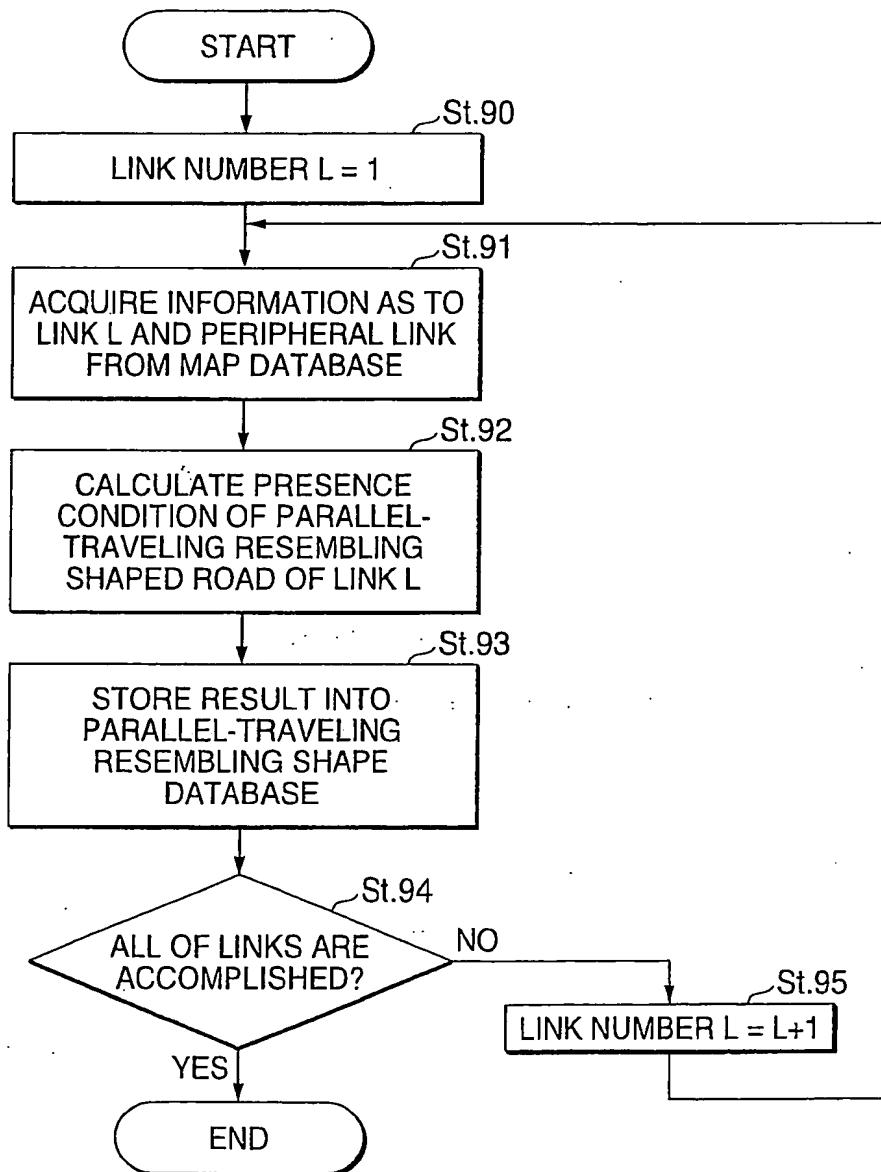


FIG. 34

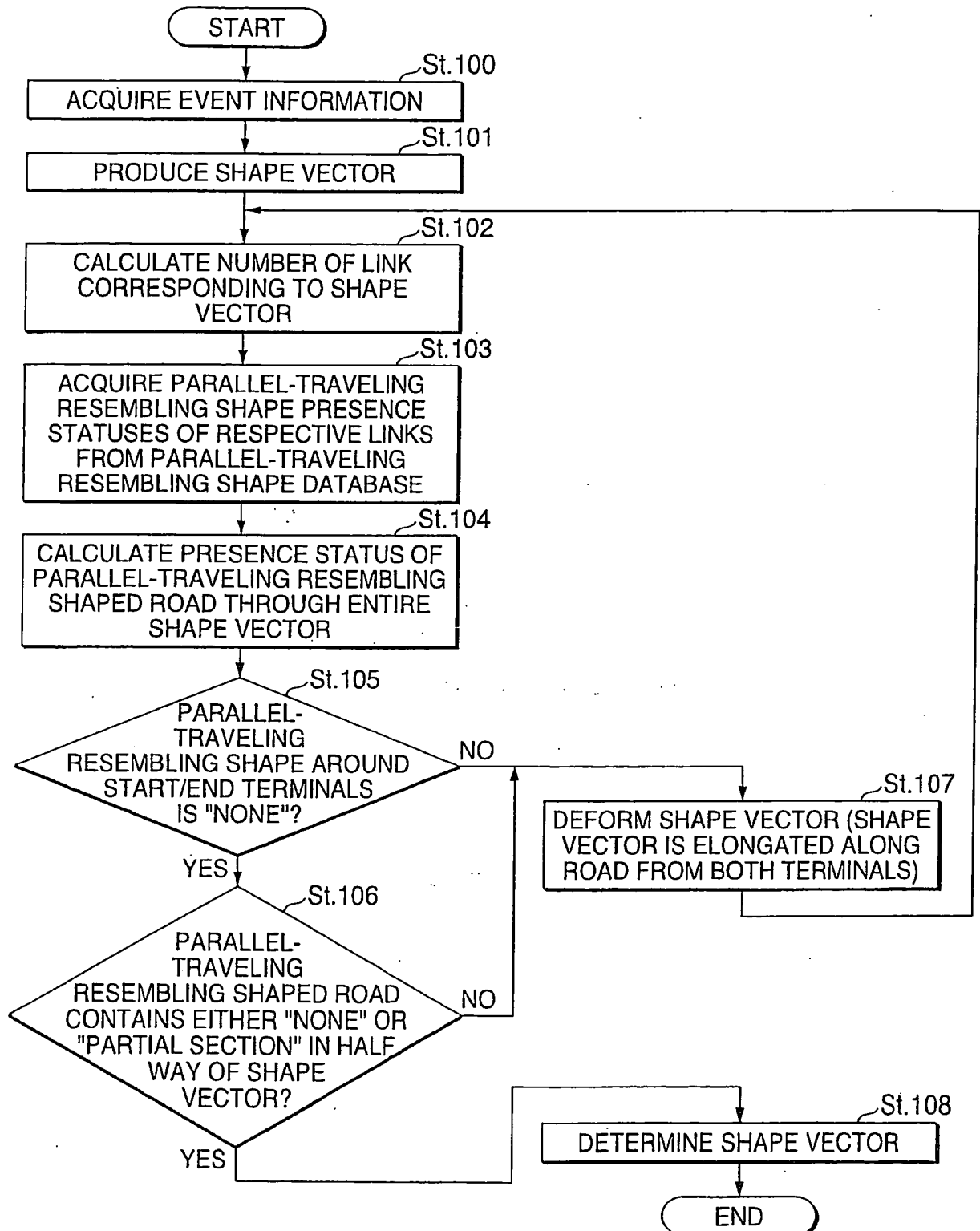
< SHAPE VECTOR PRODUCING  
PROCESS OPERATION >

FIG. 35

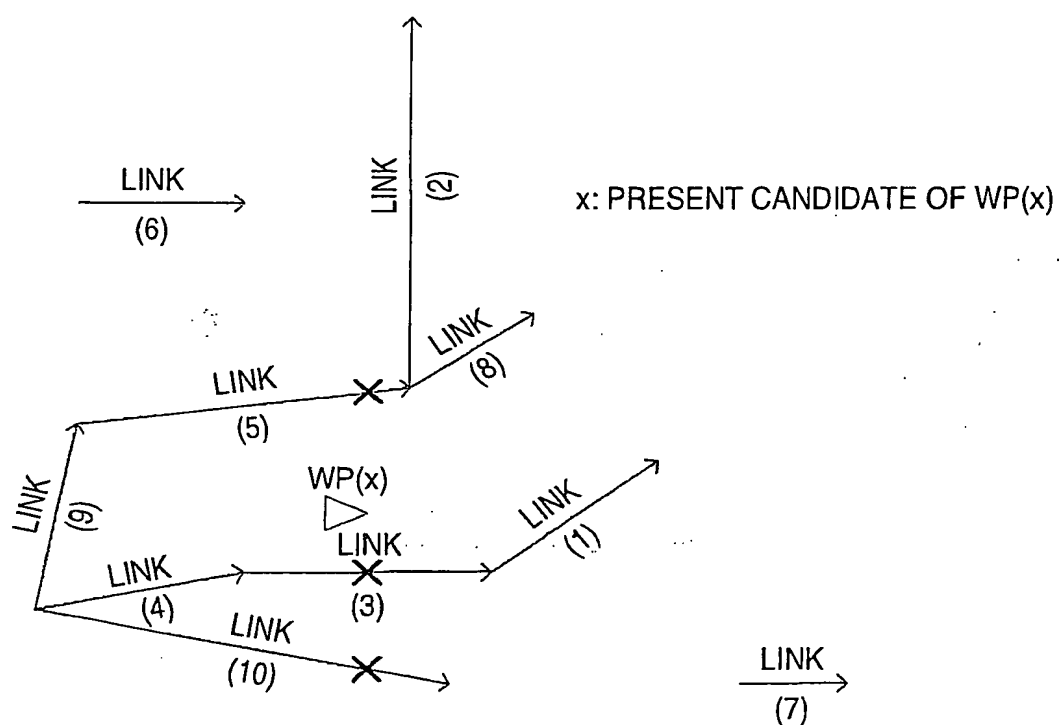




FIG. 36

(a) SHAPE VECTOR DATA STREAM

SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 1
SORT OF VECTOR DATA (= ROAD)
TOTAL NODE NUMBER
NODE NUMBER p1
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
ABSOLUTE AZIMUTH OF NODE 1
:
NODE NUMBER pN
RELATIVE COORDINATE (x <sub>n</sub> ) OF NODE N
RELATIVE COORDINATE (y <sub>n</sub> ) OF NODE N
RELATIVE AZIMUTH OF NODE N
:
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 100
:
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = ZZ
:

(CONT.)

(b)

## TRAVEL TIME INFORMATION

TOTAL NUMBER V OF TRAVEL TIME PROVIDING SECTIONS	
PROVIDED TRAVEL TIME SERIAL NUMBER = 1	
REFERENCE SHAPE VECTOR STREAM NUMBER = 8	
DIRECTION IDENTIFICATION FLAG (FORWARD DIRECTION/REVERSE DIRECTION)	
REFERENCE NODE Pa OF STARTING TERMINAL SIDE	RELATIVE DISTANCE La OF STRATTON TERMINAL SIDE
REFERENCE NODE Pb OF END TERMINAL SIDE	RELATIVE DISTANCE Lb OF STRATTON TERMINAL SIDE
TRAVEL TIME T1 BETWEEN STARTING TERMINAL AND END TERMINAL	
: :	
PROVIDED TRAVEL TIME SERIAL NUMBER V	
REFERENCE SHAPE VECTOR STREAM NUMBER = 124	
DIRECTION IDENTIFICATION FLAG (FORWARD DIRECTION/REVERSE DIRECTION)	
REFERENCE NODE Pc OF STARTING TERMINAL SIDE	RELATIVE DISTANCE Lc OF STRATTON TERMINAL SIDE
REFERENCE NODE Pd OF END TERMINAL SIDE	RELATIVE DISTANCE Ld OF STRATTON END SIDE
TRAVEL TIME Tv BETWEEN STARTING TERMINAL AND END TERMINAL = Tv	

(FIG. 36 CONTINUED)

FIG. 37

(a)

## SHAPE VECTOR DATA STREAM INFORMATION (CODED/COMPRESSED DATA)

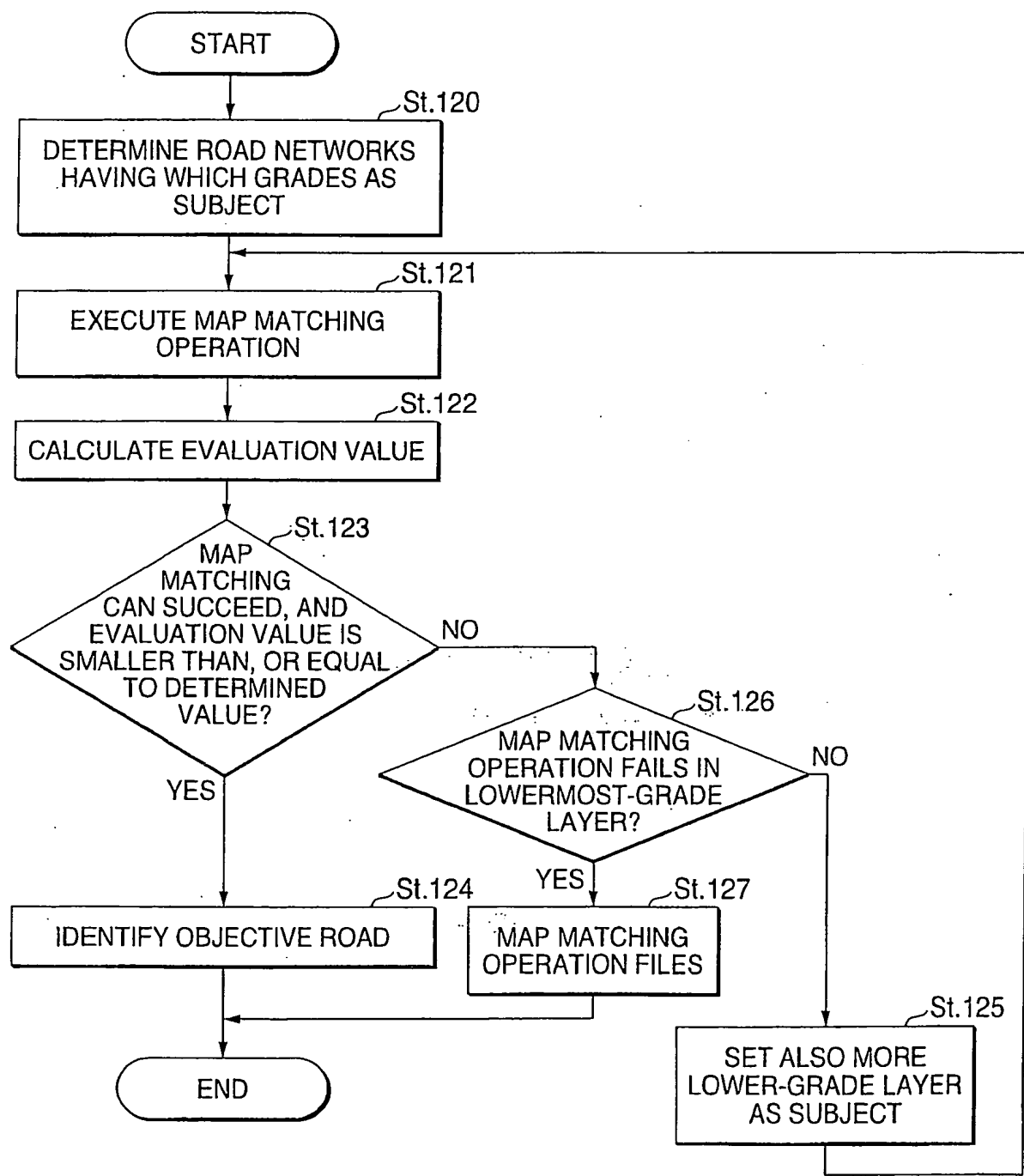
HEADER INFORMATION	
TOTAL SHAPE VECTOR NUMBER N	
SHAPE VECTOR DATA IDENTIFICATION NUMBER =1	
CODE TABLE IDENTIFICATION CODE	
PRECISION INFORMATION OF SHAPE ACQUISITION SOURCE MAP DATA	
ONE-DIRECTION TRAVEL DIRECTION (FORWARD/REVERSE/NON-DIRECTION)	
STARTING TERMINAL NODE NUMBER ps	
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE ps	
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE ps	
ABSOLUTE AZIMUTH OF NODE ps	
ps POSITION ERROR(m)	ps AZIMUTH ERROR (DEGREE)
MAXIMUM POSITIONAL ERROR(m) OF CODED SHAPE DATA	MAXIMUM AZIMUTH ERROR (DEGREE) OF CODED SHAPE DATA
CODED SHAPE DATA, IT SHOULD BE NOTED THAT CODED SHAPE DATA ALSO CONTAINS FOLLOWING INFORMATION: REFERENCE CODE SETTING CODE, SECTION LENGTH CHANGING CODE, EOD CODE	
END TERMINAL NODE NUMBER pe	
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE pe	
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE pe	
ABSOLUTE AZIMUTH OF NODE pe	
pe POSITION ERROR (m)	pe AZIMUTH ERROR (DEGREE)
:	
SHAPE VECTOR DATA IDENTIFICATION NUMBER = M	
:	

(CONT.)

(FIG. 37 CONTINUED)

(b) TRAFFIC INFORMATION	
HEADER INFORMATION	
TOTAL NUMBER V OF TRAFFIC INFORMATION PROVIDING SECTIONS	
SERIAL NUMBER 1 OF TRAFFIC INFORMATION PROVIDING SECTION	
REFERENCE SHAPE VECTOR STREAM NUMBER = N	
DIRECTION IDENTIFICATION FLAG (FORWARD DIRECTION/REVERE DIRECTION)	
START TERMINAL-SIDED REFERENCE NODE $p_a$	END TERMINAL-SIDED REFERENCE NODE $p_b$
QUANTIZING SECTION LENGTH IDENTIFICATION CODE OF DISTANCE DIRECTION	
TRAFFIC INFORMATION QUANTIZING TABLE IDENTIFICATION CODE	
CODED TABLE IDENTIFICATION CODE	
TOTAL NUMBER OF QUANTIZED UNIT SECTIONS *2	
TRAFFIC INFORMATION (INITIAL VALUE) OF START TERMINAL	
TRAFFIC INFORMATION CODED BY DIFFERENCE VALUE WITH RESPECT TO PREDICTED STATISTICAL VALUE, IT SHOULD BE NOTED THAT TRAFFIC INFORMATION CONTAINS ALSO FOLLOWING INFORMATION: SECTION LENGTH CHANGING CODE AND CHANGED SECTION LENGTH, TRAFFIC INFORMATION QUANTIZED TABLE CHANGING CODE AND CHANGED TABLE NUMBER, REFERENCE NODE CORRESPONDING POINT IDENTIFICATION CODE AND CORRESPONDING REFERENCE NODE NUMBER + OFFSET DISTANCE	
:	
TRAFFIC INFORMATION PROVIDING SECTION SERIAL NUMBER = W	
:	

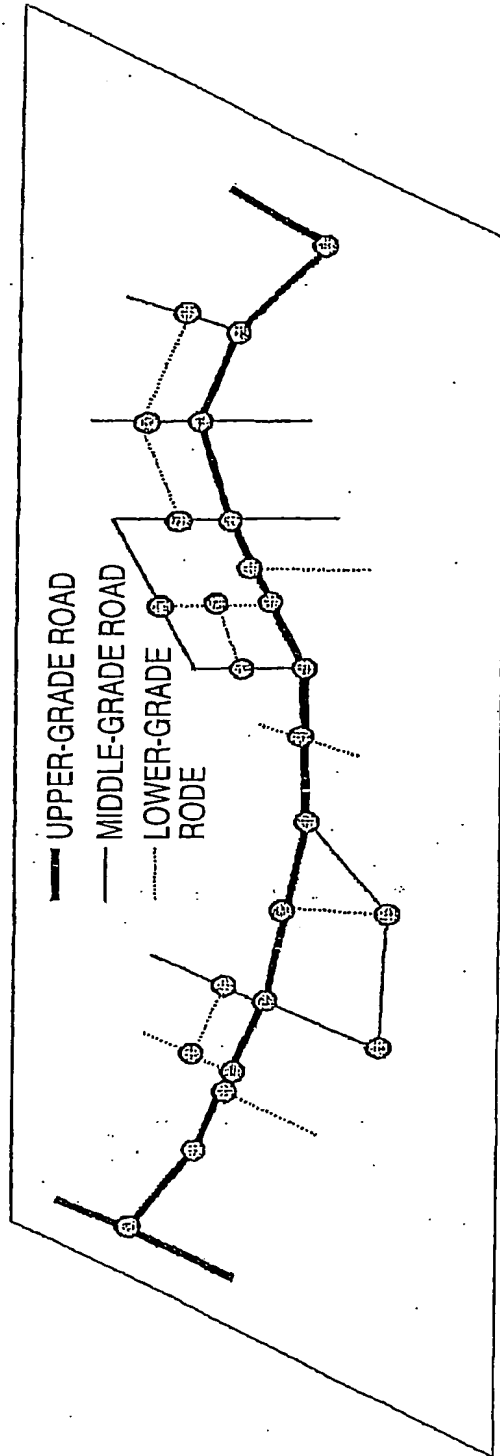
FIG. 38



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FIG. 39

EXAMPLE IN WHICH PRIORITY ORDERS ARE  
APPLIED TO ROADS IN SINGLE LAYER



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FIG. 40

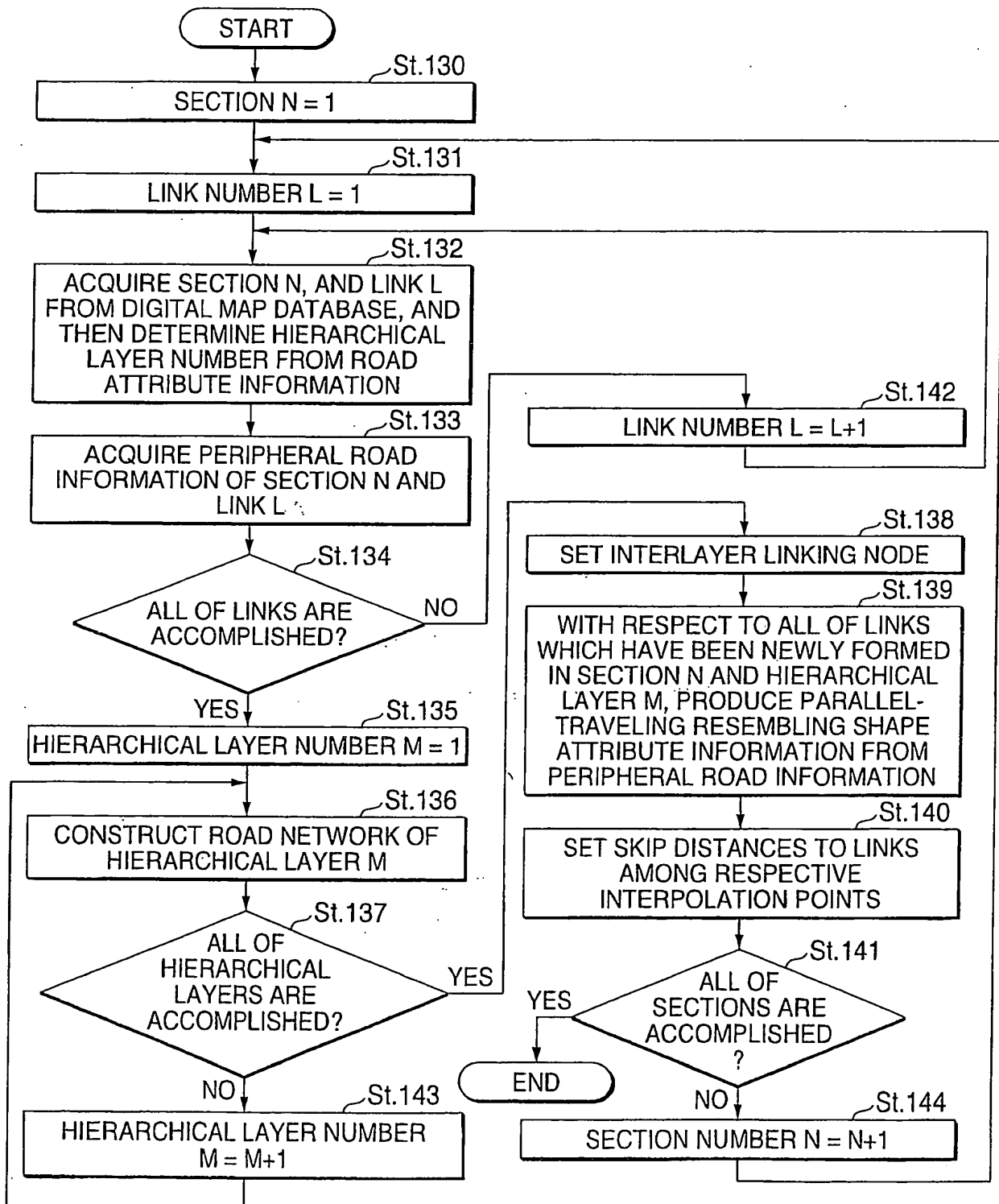
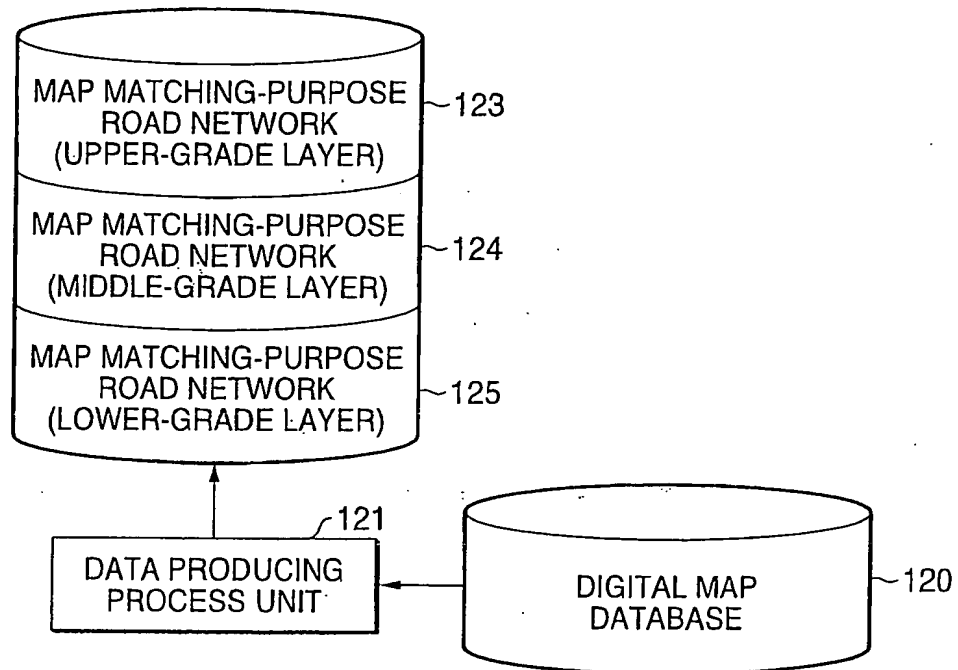
< HIERARCHICAL LAYER TYPE DATA  
PRODUCING PROCESS OPERATION >

FIG. 41

HIERARCHICAL LAYER TYPE DATA PRODUCING DEVICE



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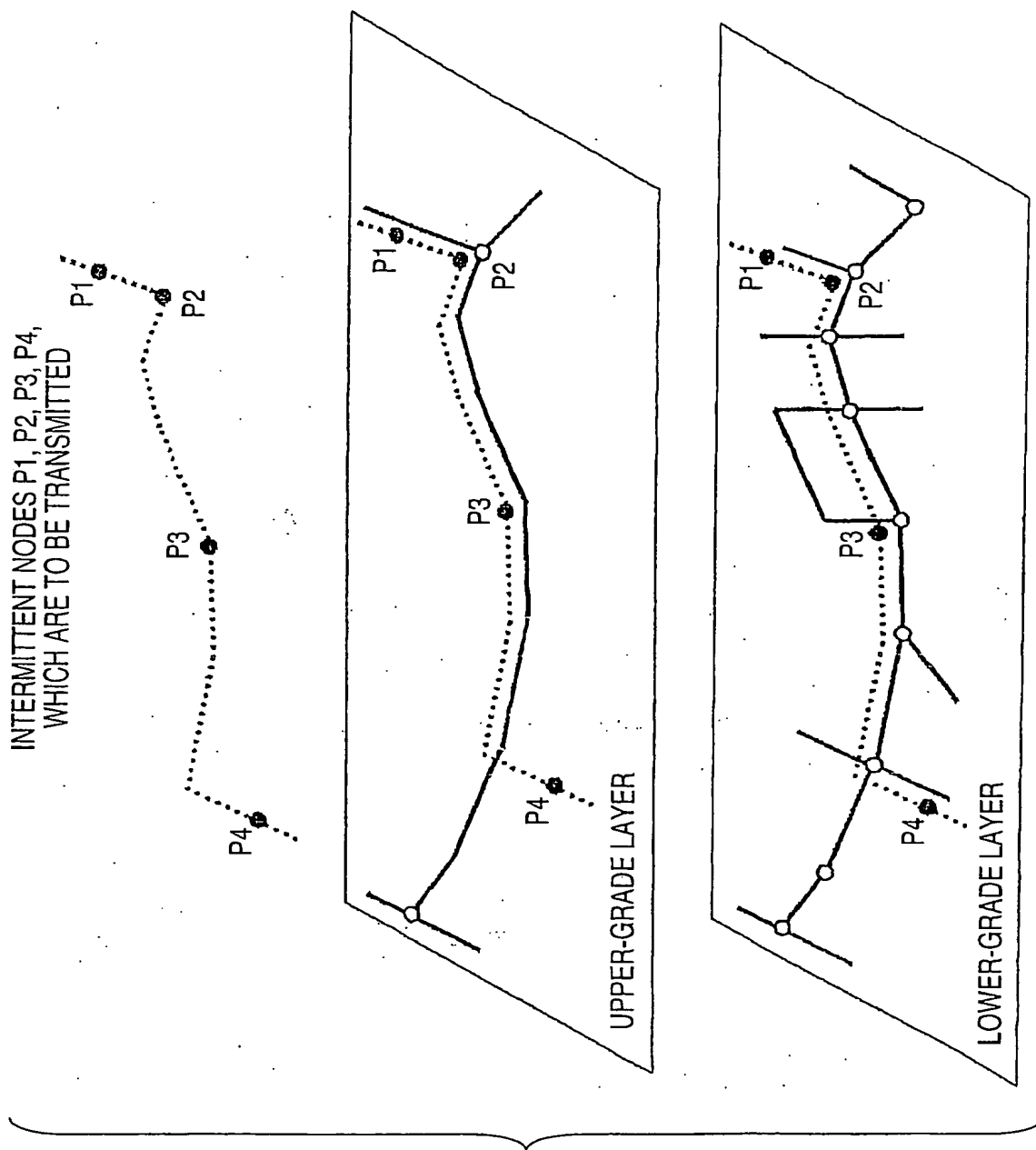


FIG. 42

FIG. 43

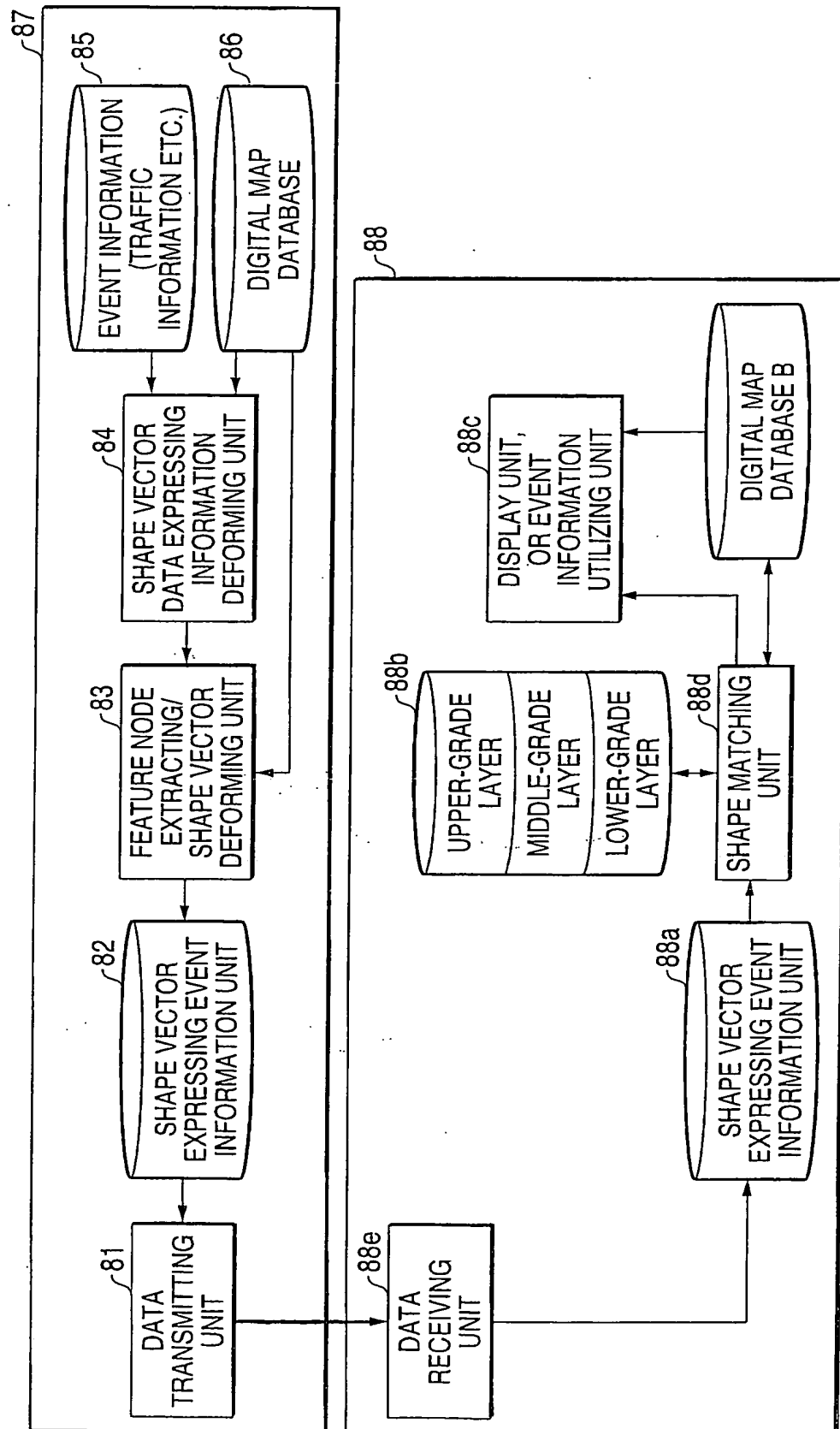


FIG. 44

## EVENT INFORMATION

REFERENCE SHAPE VECTOR STREAM NUMBER (= 56)	
EVENT 1 (= CLOSED-TO-ALL-VEHICLES EVENT)	
DETAILED EVENT INFORMATION (CLOSED-TO-ALL-VEHICLES ETC.)	
NODE NUMBER 1 ( $P_m'$ )	NODE NUMBER 2 ( $P_n'$ )
RELATIVE POSITION OF EVENT FROM $P_m'$	
DIRECTION IDENTIFICATION FLAG (= 1)	
⋮	
EVENT "n" (TRAFFIC JAM)	
TRAFFIC JAM DEGREE RANK	
NODE NUMBER 1 ( $P_m'$ )	NODE NUMBER 2 ( $P_n'$ )
EVENT RELATIVE POSITION 1 FROM $P_m'$ (START TERMINAL SIDE OF TRAFFIC JAM)	
EVENT RELATIVE POSITION 1 FROM $P_m'$ (END TERMINAL SIDE OF TRAFFIC JAM)	

SELECT NODES TO BE FEATURED NODES, AND SET SELECTED  
NODES TO NODE NUMBERS  $P_m$ ,  $P_n$ , ETC.

FIG. 45

## LINK INFORMATION

ROAD SORT CODE
ROAD NUMBER
TOLL ROAD CODE
START NODE NUMBER $p_4$ , AND END NODE NUMBER $e_4$
BELONGING HIERARCHICAL LAYER: UPPER, MIDDLE, LOWER
TOTAL CONNECTION LINK NUMBER $I_4$ OF $p_4$
CONNECTION LINK ANGLE 1 OF $p_4$
⋮
CONNECTION LINK ANGLE $I_4$ OF $P_4$
⋮
TOTAL CONNECTION LINK NUMBER $I_n$ OF $P_m$
CONNECTION LINK ANGLE 1 OF $P_m$
...
CONNECTION LINK ANGLE $I_n$ OF $P_m$

FIG. 46

## NODE INFORMATION

VECTOR DATA SORT (= ROAD)	
TOTAL NODE NUMBER	
BELONGING HIERARCHICAL LAYER INFORMATION	
DEFINITION ALONG FORWARD DIRECTION (= 2)	DEFINITION ALONG REVERES DIRECTION (= 1)
NODE NUMBER p1	
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1	
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1	
NODE NUMBER p2	
RELATIVE COORDINATE (x2) OF NODE 2	
RELATIVE COORDINATE (y2) OF NODE 2	
⋮	
NODE NUMBER pn	
RELATIVE COORDINATE (xn) OF NODE n	
RELATIVE COORDINATE (yn) OF NODE n	

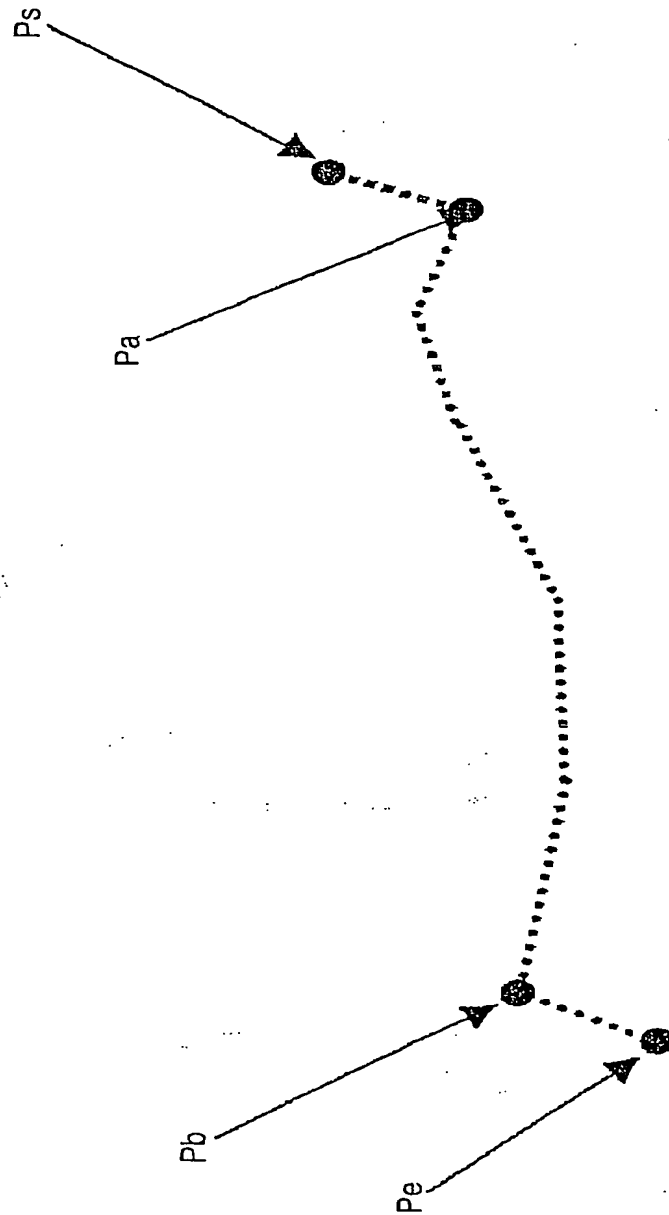
## FIG. 47

## SHAPE VECTOR

SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 1
VECTOR DATA SORT (= ROAD)
BELONGING HIERARCHICAL LAYER (UPPER, MIDDLE, LOWER)
TOTAL NODE NUMBER
NODE NUMBER p1
X DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
Y DIRECTION ABSOLUTE COORDINATE (LONGITUDE) OF NODE 1
ABSOLUTE AZIMUTH OF NODE 1
⋮
NODE NUMBER pN
RELATIVE COORDINATE (x <sub>n</sub> ) OF NODE N
RELATIVE COORDINATE (y <sub>n</sub> ) OF NODE N
RELATIVE AZIMUTH OF NODE N
⋮ ⋮
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 56
⋮ ⋮
SHAPE VECTOR STREAM IDENTIFICATION NUMBER = 100
⋮

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FIG. 48



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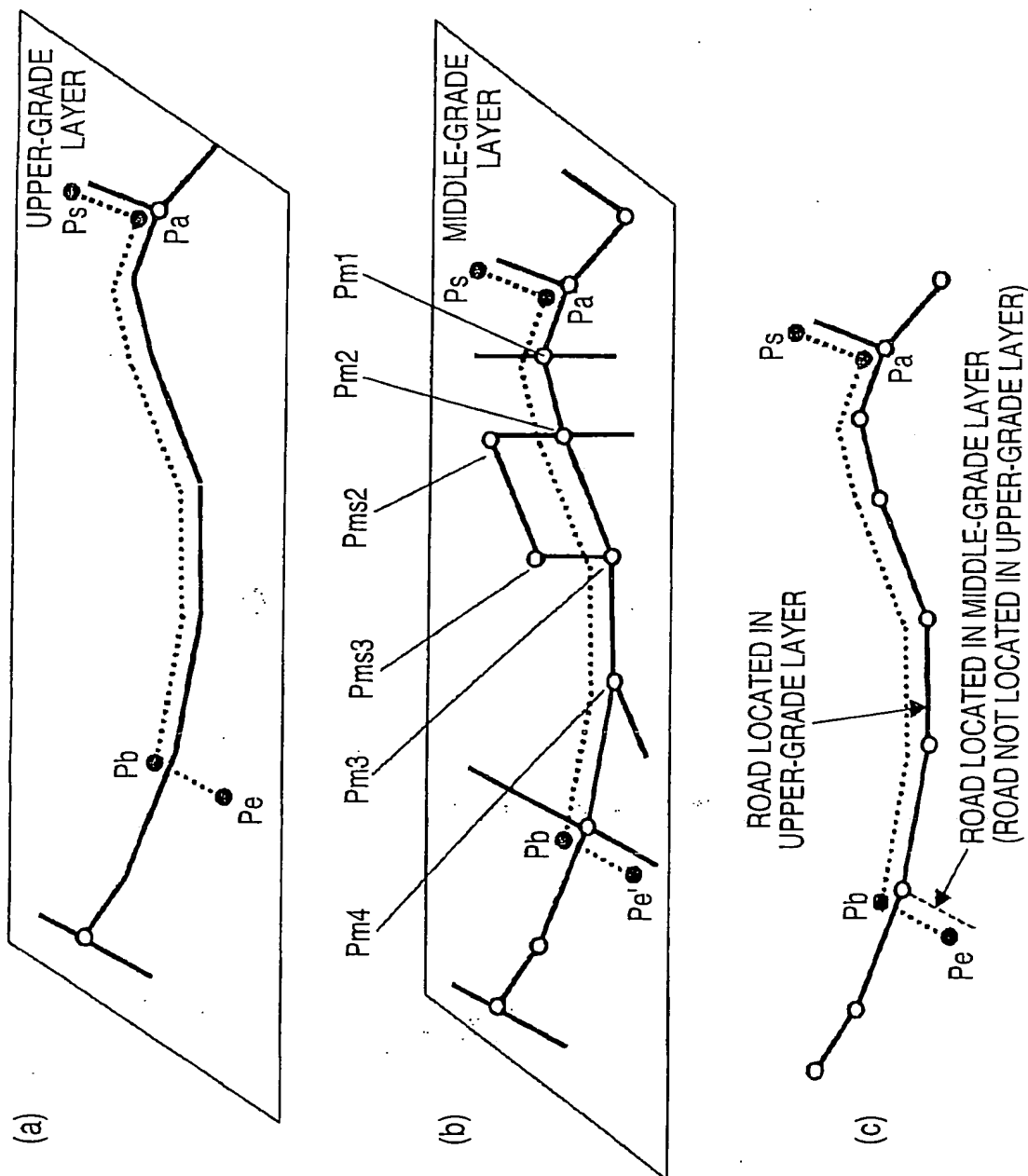
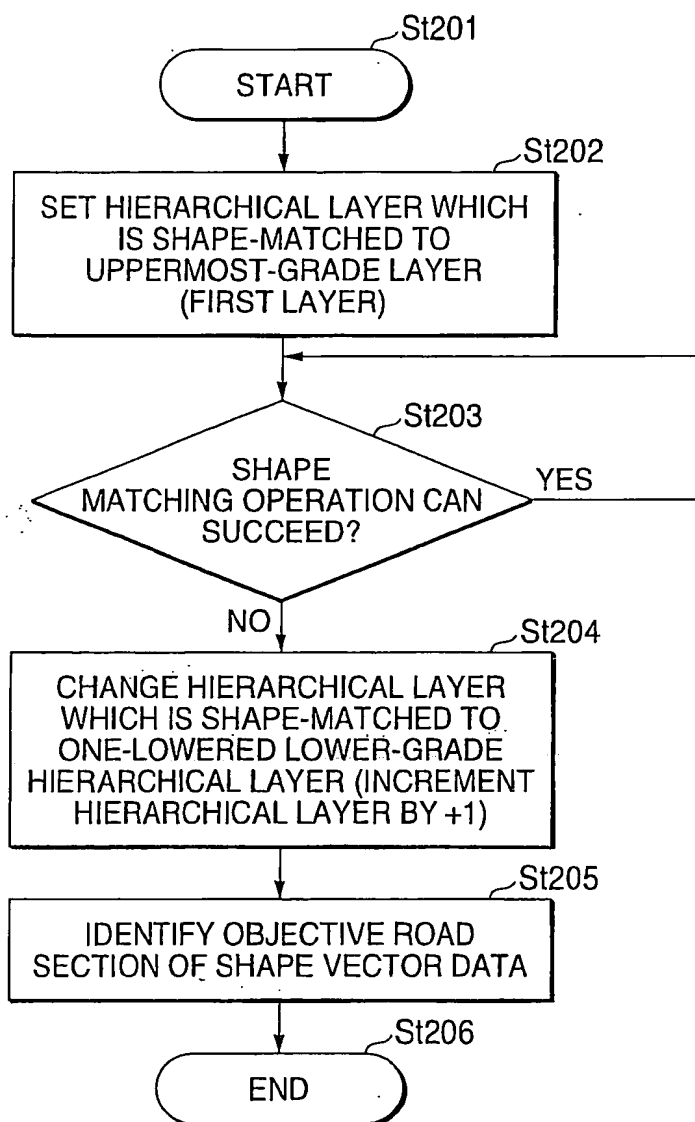


FIG. 49



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FIG. 50



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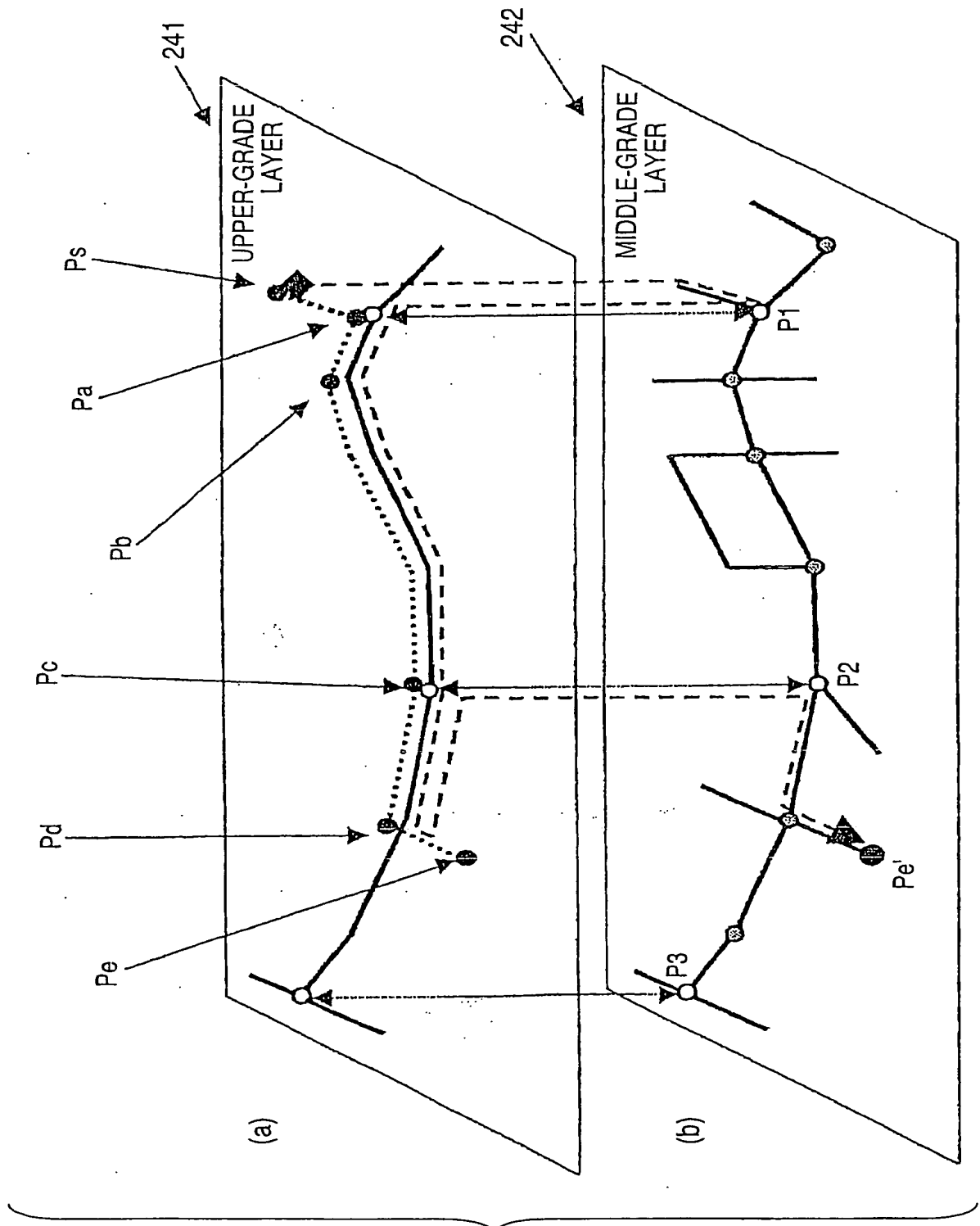


FIG. 51

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FIG. 52

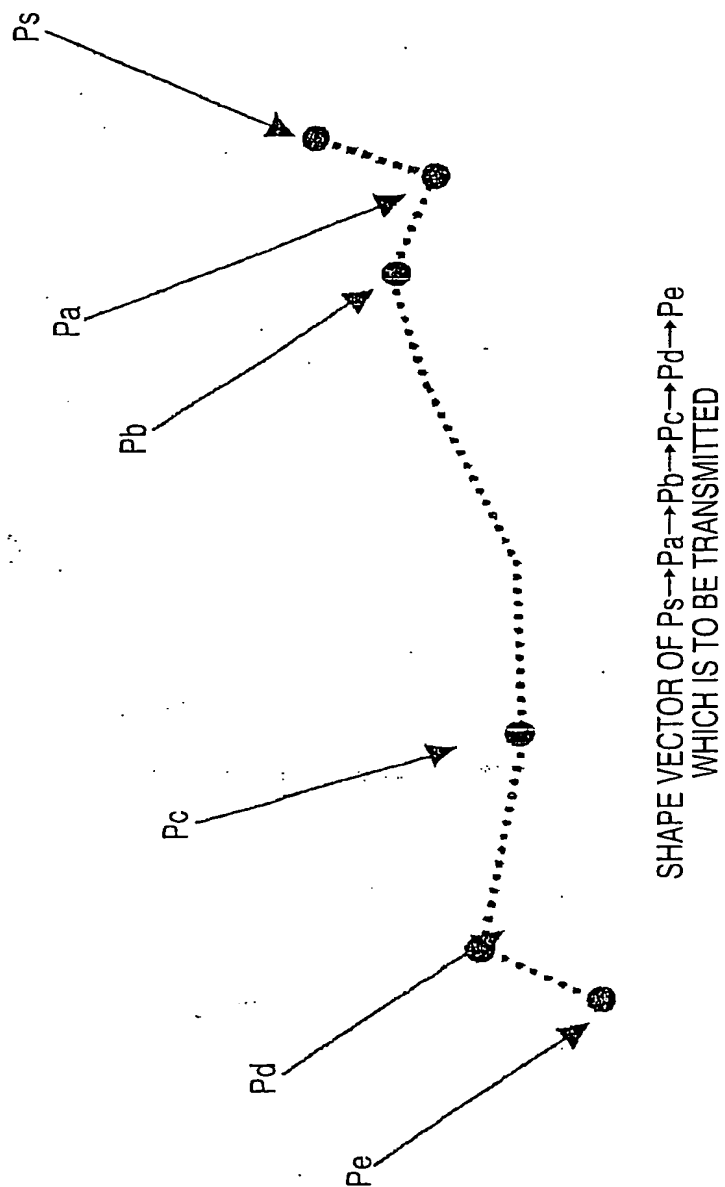
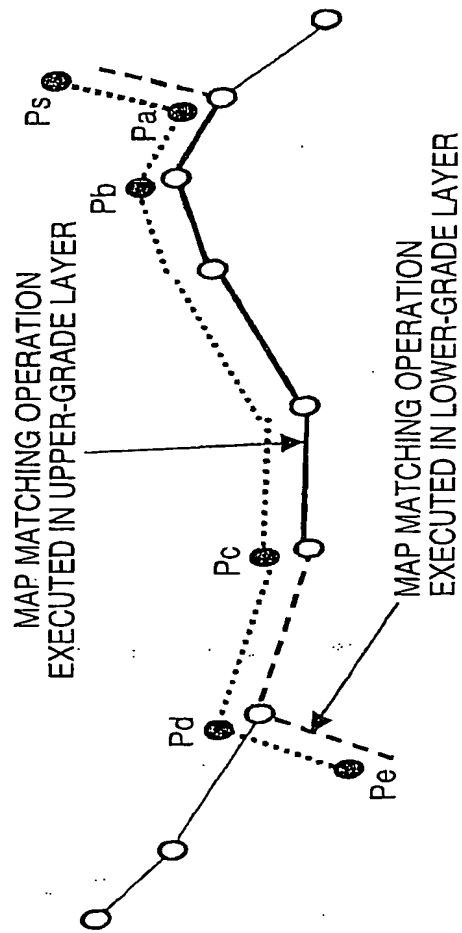


FIG. 53



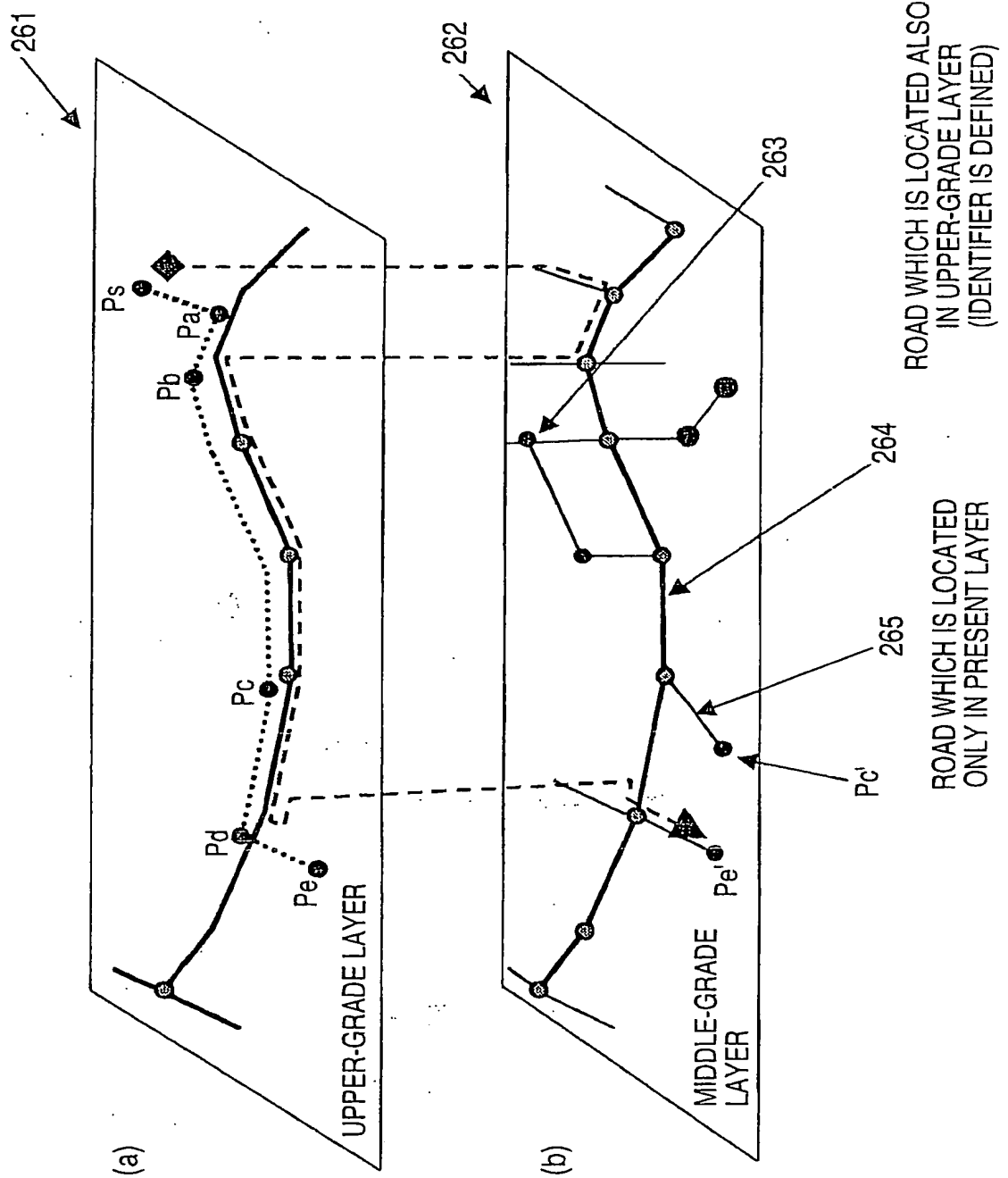


FIG. 54

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FIG. 55

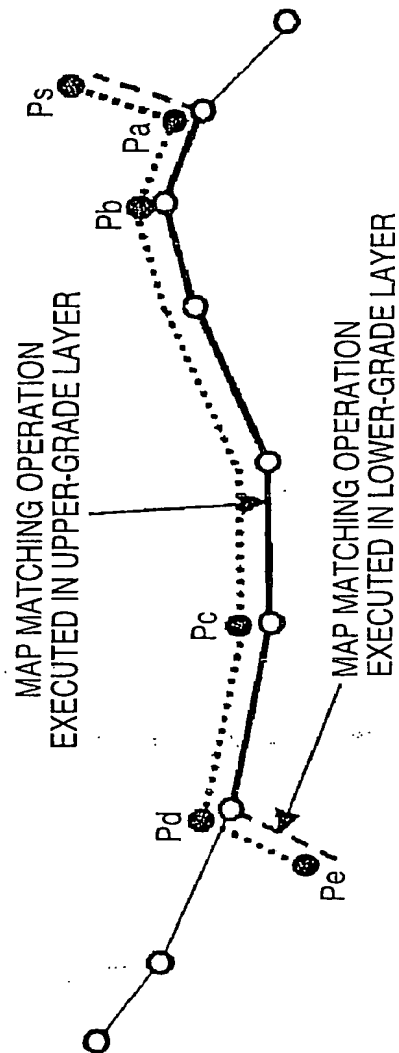


FIG. 56

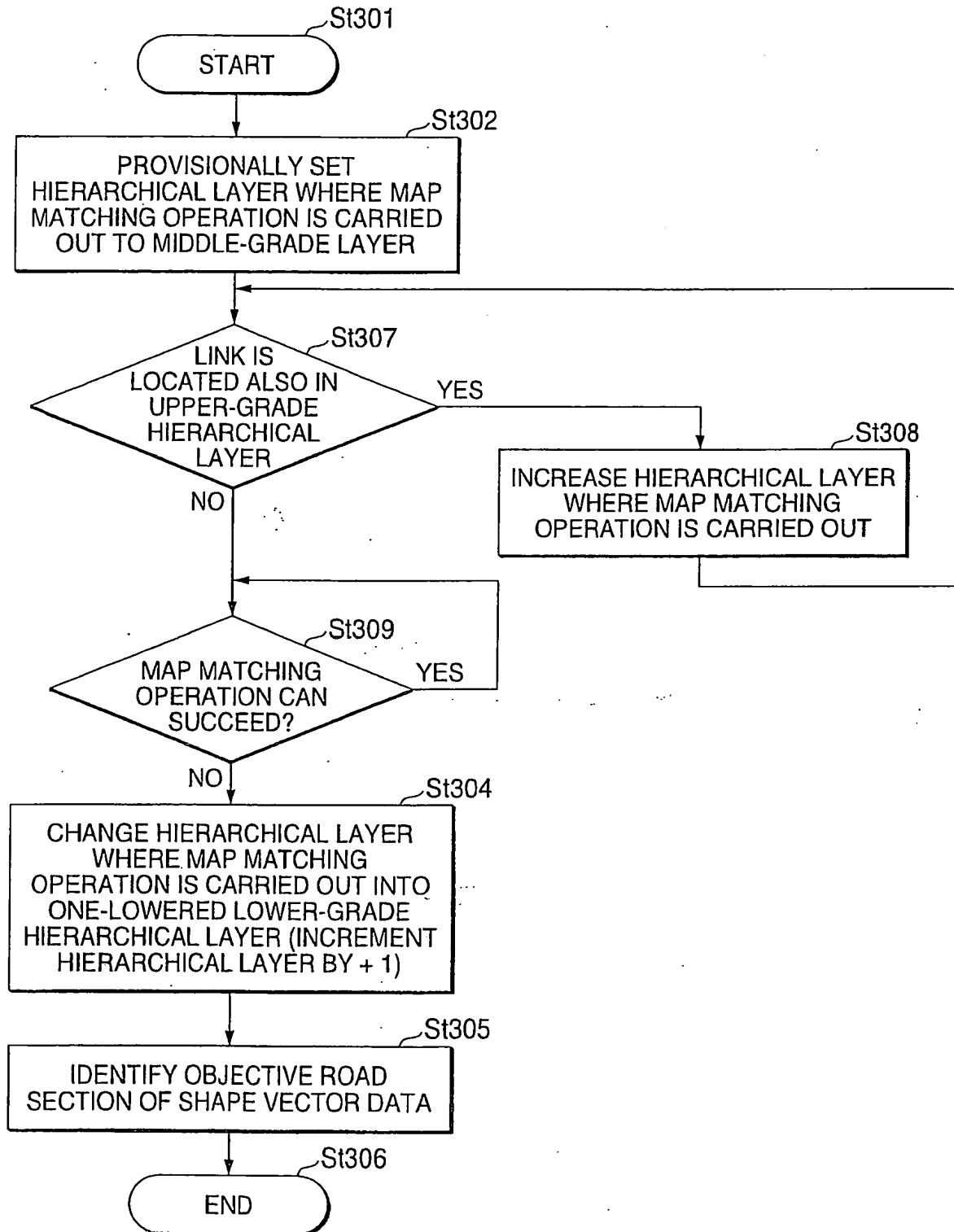


FIG. 57

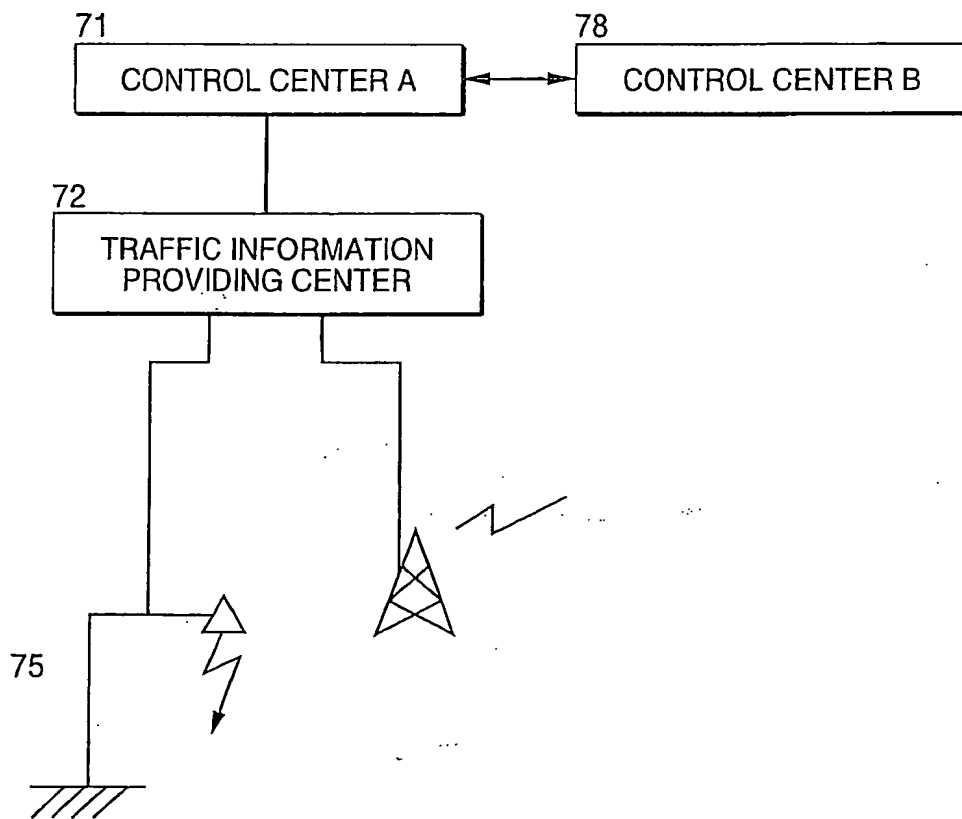




FIG. 58

